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A Half Century of Good Work.

On September 9, 1854, there was a boiler explosion at Rochdale, England, which killed ten persons. Except for the death list, this explosion was not noteworthy, for such things were chronic about that time. This particular explosion, however, will go down in engineering history as the incentive for the organization of the Manchester Steam Users' Association. At that time it was customary to explain such accidents by some strange, undefined property of steam, with which no number of safety valves could contend. That was the period when any physical phenomenon that was not self-evident was explained by some kind of a spheroidal fantasy. Sir William Fairbairn was of the opinion that such explanations were nonsense, and that explosions resulted generally from the poor construction or condition of the boilers. He accordingly called together, ten days after the Rochdale accident, a number of men interested in the subject, and the result of this meeting was the association, which was organized as a mutual society to provide for a thorough inspection of the boilers of the members.

Unlike most organizations for the same purpose, the Manchester Association has refused to adopt the principle of joint stock insurance. It has issued considerably over 150,000 guarantees of safety, but that is all. The technical side of its work is the most interesting, however, and began almost as soon as it started on its career. It has paid much attention to feed water and the prevention of incrustation. It has made investigations of coals. It has repeatedly investigated the subject of stoking, and went so far a few years ago as to send an expert stoker to many boiler plants to teach firemen how to avoid producing smoke. It has done a great deal by testing, designing and superintending the construction of boilers to teach good practice in such work.

The most interesting feature of the Association's work has been its long campaign of public education regarding the causes of boiler explosions. Early in its career it devoted considerable attention to the explosion of kitchen boilers, particularly the effect of discharging cold water into them when they were red hot. This investigation was followed by others of the same nature with steam boilers, and as a result the Association took a very firm stand against the current opinions on such subjects. Finally tests were made with a full-size Lancashire boiler, which established the correctness of the Association's contention that most explosions are due to poor construction or defective maintenance. The results of this experimental work were published in 1890 in a volume which will long remain a standard authority on the subject.

Although the views regarding explosions which were held by the Association gradually gained ground among steam plant designers and owners desirous of securing safety in the boiler room, they were steadily opposed by strong influences. In order to obtain all useful information on the subject, the Association sent an engineer to the scene of every explosion until the Board of Trade was instructed to do so. It was impossible to secure any official action, however, for many years which would make it compulsory, either directly or indirectly, to build boilers on safe principles and to keep them in a safe condition when built. Finally Parliament was persuaded to require the Board of Trade to investigate every explosion, and provision was made for fining those responsible for serious explosions where marked culpability was shown. Compulsory inspection has not yet been brought about, although a great step forward was made in 1901, when the Factory and Workshop Act of that year was made to include a clause requiring such an inspection of factory boilers at least once in every fourteen months.

It would be idle to claim that all this progress is directly attributable to the Association, but it can be safely said that the original incentive for it and the continual, steady striving for it during the last half century are due to the organization which Sir William Fairbairn brought into existence in 1854. The conservatism that has marked all its experimental work and the persistence with which it has followed and remained faithful to the ideals of its founders are noteworthy in a period when most people have been inclined to jump from novelty to novelty in a striving for a reputation as innovators and representatives of the latest developments in both theory and practice.

Improvements in Electric Street Lighting.

The customary methods of lighting streets electrically are open to considerable improvement, although many advances have been made since the days of the lofty towers which made a city resemble, from the distance, a group of lighthouses. In many early attempts to furnish a fairly uniform illumination, the lights were hung so high that they were of little more utility at the street level than the blazing signs now employed to point out the merits of pickles and whisky. It is now recognized that serviceable illumination at the street level and not up in the tree-tops is desired, yet very few attempts to give it have been recorded. In fact, there are some cities where the incandescent gas mantle has come back into service as more satisfactory to the public than the arc light, although there seems little reason why the latter should not be at least equally acceptable to an open-minded observer.

An explanation of the weak points of the present system has been given recently by the "Electrical World and Engineer," which very naturally attributes part of the trouble to the failure to locate the lights along the streets in the best manner. "A vote to place an arc light in front of Councilman Flaherty's sample room does not always mean a gain to public lighting." This point is well taken, and will be heartily indorsed by those city engineers who have been made responsible for the position of the lights. One man is desirious of having a light in front of his property, while another threatens vengeance if one is anywhere in his neighborhood. It is not improbable that lights are generally too far apart now, so that they fail to reinforce each other. This reinforcement is essential to secure a fair average illumination, and is really as important as the nominal candle-power of the lights.

As for the lights themselves, it is gratifying to notice the acknowledgment by the journal mentioned that these are open to improvement. It is self-evident to any one who has observed the bright glow over a distant city, that a great deal of illumination is wasted, and a better use of reflectors could doubtless be introduced in most cities. Enclosed arcs of moderate power with high current density in the arc may prove practicable for street lighting, and the number of illuminating units be increased without increasing the amount of energy. It is also probable that arcs of small amperage will give good results if supplied with carbons somewhat smaller in diameter than is customary. These details will be worked out by the manufacturers' engineers, however, as soon as the officials entrusted with street lighting responsibilities insist on more numerous low-power lights, placed so as to reinforce each other and provided with some means for directing all their rays downward instead of being partly lost up among the stars.

Reinforced Concrete Buildings.

A couple of years ago it was the fashion to speak of that time as the concrete age, but the progress of one section of concrete construction, that of reinforced concrete, makes it possible to speak of the present time as the reinforced concrete age without much risk of serious dispute. It is unlikely that any one who is not thoroughly in touch with the legitimate growth of concrete-steel construction appreciates the rapidity with which it is coming into vogue. This does not refer to those freak constructions of interest mainly as an indication of the aberrations to which an untrained mind is prone, but to the reasonably well considered buildings and bridges designed by reputable and competent engineers and erected by contractors who have no desire to do anything but high-grade work.

The progress in bridge construction has received much more attention than that in any other class of concrete-steel, because people accustomed to discuss their work in technical meetings have been interested in it. Consequently the printed information concerning bridges of this nature is voluminous; in fact, it may be considered so voluminous that it has overshadowed the interesting work done in reinforced concrete in buildings. This latter is particularly important just now because it seems probable that many industrial plants as well as structures put up in cities for light manufacturing and as warehouses will probably be constructed partly or wholly of reinforced concrete. This view in no way reflects on the manifest merits of terra cotta systems like that described in this journal on Feb. 25, but simply recognizes the possibilities of the new material along certain lines which have nothing to do with engineering considerations.

The first of these merits of reinforced concrete is its ready execution. In these times, when the man who works on a building considers himself much more important than the capitalist who supplies the funds, it has become a question when it will be possible to complete a masonry and steel structure after it has been started. So many unions of skilled workmen now exist that when they are not engaged in fighting the master workmen they are scrapping among themselves, and during all this period of warfare the men are idle. Consequently when they are at work they expect to get very large wages in order to replenish their depleted larders, and the man whose money is standing idle all this time gets nothing but trouble in return for his investment. With concrete construction nothing of this sort can occur on such a scale, for with it skilled labor is not required—merely skilled supervision. No attempt to unionize unskilled labor has been successful up to the present time, and for this reason it seems improbable that the delays incident to ordinary building operations will occur with the erection of concrete-steel structures.

Another point to be considered is the fireproof character of reinforced concrete buildings. Such structures, with walls of brick, concrete blocks or thin concrete, and metal window sash, are practically fireproof and offer two marked advantages. The first of these is the practicability of putting up high warehouses in cities like New York, where the building laws limit the height of structures of so-called mill construction to six stories. This is an important consideration, particularly when it is considered that the difference in cost in many parts of the country between the two classes of construction is practically nil. The second consideration deserving mention is the probable decrease in insurance premiums which will follow the adoption of concrete in place of mill construction. While the saving on the building itself may not be particularly important, it is not unlikely that the saving of premiums on stock carried in structures like those illustrated in this journal last week will be considerable.

Many structures of reinforced concrete have been built recently which are now in use carrying machinery of considerable weight, and while these buildings have not been in service very long it seems likely from the limited experience with them that they will serve their purpose well. In designing a shop of this construction it is, of course, important to know when the plans are prepared just what will be the weight and location of the machinery they are to contain. With this information in hand there is no reason why a satisfactory system of construction cannot be devised, provided the plans are worked out by a competent engineer who will consider all their details, and their execution is entrusted to good contractors with a reputation to maintain as specialists in such work. With cement at its present low price, it would seem as though the advantages of this type of construction should result in a great amount of it during the year.

Trade Literature.

The lights and shades of gay Paris do not offer a greater contrast than is afforded by the trade publications issued to interest engineers. Some of these are concise statements of useful information, well written and illustrated, free from exaggeration and as reliable as the average technical handbook. Some of them are employed regularly in engineering schools. It is safe to say that these pamphlets and books, which find a permanent place in an engineer's library, have a considerable though indirect influence on the annual sales of their publishers' products.

In contrast with these publications is the class which exhibits a frantic desire to attract attention and then hold it by any kind of argument long enough to get the idea of the publishers' business fixed in the recipient's mind. No attempt is made to have the information in these pamphlets of any permanent value, for their sole purpose is merely to open up the way for correspondence. This class of trade publication, which is of no use to anybody except the people who get it out, is often sent to this journal for notice, and the purpose of this note is to point out the reason for declining to do this. Trade publications of any value to the reader are always mentioned in the column reserved for such information; the pamphlets there mentioned are of sufficient value to merit filing. Circulars and pamphlets of no technical value, sent out for the purpose of opening the way for correspondence, are merely the equivalent of advertisements in trade publications, which are valuable in themselves, but not of a nature meriting special mention in the reading pages of a reputable journal.

The Present Condition of the Panama Canal Project.

In last week's Current News Supplement there was published the full report of the committee on engineering of the Isthmian Canal Commission and some brief comments on it. A careful reading of that report will show that the present condition of the canal project as developed by the Commission is worthy of most careful and extended consideration, particularly in view of the mass of misrepresentation and bitter criticism of the Commission's work. This report covers far more ground than may appear at first reading. As a matter of fact there is direct and thorough treatment of practically all of the main features of the proposed canal, whether it be built at sea level or with locks. The report shows on its face that a great amount of work has been done by the Commission since its creation and the organization of its engineering field parties last May and June. Further than this, it is now clear that the Commission's organization was so created and directed as to cover efficiently what is in reality the entire canal field, embracing not only the great features of the canal proper, but also matters of such essential importance as the control of the Chagres River and the protected harbor at Colon, to say nothing of the actually large forces required for the care and administration of the materials and supplies on the isthmus and the sanitary, hospital and quarantine organization. Criticism of the Commission based on alleged non-performance of the great work before it is shown by this report to be absolutely baseless, for the organization of the Commission's forces has been well directed and efficient.

There are three prominent features of the canal project discussed in this report which may be stated, in the order of their importance, as the sea-level canal, the control of the Chagres floods by the great dam at Gamboa, and the protected harbor at Colon, with the inner harbor at the mouth of the canal. The chief data, although not all, on which the recommendation of a sea-level canal is based, have evidently been secured from actual excavation in the Culebra cut during the past three or four months. These data relate chiefly to the cost and rate of excavation in the dry cuts which will extend from the vicinity of Bohio, in the northerly portion of the canal, to the vicinity of Miraflores, about 7 miles from the Panama end of the canal. It is interesting to observe that this stretch, throughout which excavation in the dry must be made to produce the sea-level canal, is but about 24 miles, a very little less than one-half the total length, the other portion, a little greater than one-half the entire length, being a sea-level waterway in any event.

The excavation in the Culebra cut, so far as made, covers not only the clay which, like all clay in this country, slides when it is wet, but the indurated clay underneath that, the shale or soft rock and a large amount of hard rock of a basaltic nature. One or two of the steam shovels already in operation have worked in this hard rock and demonstrated their capacity to handle it at a rate which has already reached 1,300 or 1,400 cu. yd. during some days. Even greater quantities of clay have been handled by the same shovels during the same time. It has also been stated that some of the old French excavators, having been put in a greater state of efficiency by the Commission than they ever before possessed, have reached about the same rate of excavation in clay and other soft materials, although they are practically useless in rock. When it is remembered that the present organization of the whole plant in the Culebra cut, particularly the tracks serving the excavators, is in an experimental condition and lacks the efficiency which it will attain when under complete organization, it would seem that the Commission, in its estimates both as to time and rate for the sea-level cutting, is conservative and safe.

The greater part of this cutting is found within a length of about 8 miles of the line from a point near Obispo to Paraiso. Within that distance it is certainly entirely feasible to work as many as 100 steam shovels, as proposed by the chief engineer, if it should be found advisable to do so. It is further perfectly feasible to work two shifts of men in twenty-four hours, although, it is understood, the chief engineer has not counted upon that procedure in making his present estimates. The entire volume of excavation to be taken out by the steam shovels for a sea-level canal does not exceed 250,000,000 cu. yd. Even if only eight-tenths of the entire force of steam shovels and other excavators are in workable condition at any one time, it is plain that estimates based on conditions no more favorable than those already existing justify 10 to 12 years as a period within which the entire work may be completed so as to pass vessels at the end of that time freely from one ocean to the other.

The estimate of cost used by the committee, viz., 50 cents per cubic yard, as an average for all classes of materials, would appear to be even more conservative than the estimate of time. Steam shovels and French excavators already operating under disadvantageous conditions of incomplete organization and in a fragmentary way, have actually handled all grades of materials at what appears to be sensibly less than 50 cents per cubic yard, indicating that under completed organization and with systematic operation the cost may fall as low as even 40 cents. The committee has done wisely, however, to adopt for its present estimates the unit price of 50 cents, and will enlist the confidence of engineers by so doing.

It appears from the investigations which have been made by the Commission that the foundations of the great Gamboa dam may be constructed without serious difficulty, it having been shown that bedrock is less than 60 ft. below the surface of water in the river as it stands during a great portion of the year. This is eminently gratifying. While it is entirely feasible to construct a dam at Bohio, even with the great depths of rock found there, it is much more gratifying to learn that in connection with the sea-level project the dam for the control of the Chagres River involves no unusual procedure in its construction. It will be interesting to learn in due time the results of the investigations of the Commission now being made in regard to the relative economy of taking the surplus waters from the Gamboa Lake either through an independent diversion channel already partially constructed by the French company, or through a tunnel piercing the dividing ridge toward the Caribbean. It appears that the length of this tunnel is materially less that half that of the tunnel required to make a corresponding diversion toward the Pacific.

The proposition to build a breakwater across the mouth of Limon Bay to protect Colon harbor against such severe storms as that which occurred while the commission was on the isthmus in January, is apparently a new consideration in connection with the canal project, but it is a most important one. There are probably few who will disagree with the committee in its forceful statement that no harbor unprotected against such storms, even though they occur so rarely as once or twice a year only, can be considered a satisfactory harbor at the Caribbean end of the canal. The proposed breakwater is an essential feature of the works appurtenant to the canal in its finished condition, and it is highly probable that the proposed inner harbor at the mouth of the canal will also be a necessary adjunct. The direct entrance to the canal without passing through this inner harbor made feasible by the construction of the proposed breakwater is another new feature of the project. The construction of that direct entrance, however, will add to the efficiency of the canal as a waterway between the two oceans, and it will doubtless be found advisable to build it.

There are other features of the works covered by this report which merit extended comment, but enough has been shown to indicate that the members of both the committee and the Commission appreciate the great responsibilities which rest on them, and that the discharge of these responsibilities is at least safe in their hands. The report may be further taken to indicate as fortunate the outcome of proposed congressional action affecting radically the composition of the Commission. While the President doubtless has power under the present law to readjust the Commission as a whole to its work or even to change the personnel, it is safe to state that such action, if taken at all, should be directed with great care in view of the important results already accomplished on the isthmus.

Notes and Comments.

Municipal Electric Fitting, including the sale of supplies and wiring of buildings, is proposed again by the London County Council, which will apply to Parliament for permission for the London boroughs to engage in such work. The project is strongly opposed by the London section of the Electrical Contractors' Association, principally because the municipal plan contemplates payment for work by a sort of rental. Such a scheme, as one speaker pointed out, is so communistic that it should be accompanied by municipal groceries, clothing shops and other lines of business, and thus bring to an end at once any chance of private enterprise.

An Alternating Stress Testing Machine has recently been built for the British National Physical Laboratory. It has a crankshaft driving four connecting rods, two on either side of the shaft. Each of them is joined to a horizontally moving cross-head by means of clamps and a specimen to be tested, the inertia of the cross-head producing the stress. Four specimens are tested simultaneously, thus enabling material of different quality to be tested under the same conditions. Special care has been given to producing a machine having exactly equal reciprocating masses and a balanced crankshaft, and there is an ingenious method of compensating for the breakage of a specimen so that the fracture will have no effect on the operation of the apparatus. It is stated in "Engineering" that the maximum speed is 1,100 r.p.m., but another crankshaft will be provided for speeds up to 2,000 r.p.m.

The Passaic Valley Sewerage Project has been declared unconstitutional by the Court of Errors and Appeals of New Jersey, and this much-needed work is accordingly set back for some years. The failure of the project in the court of final jurisdiction is not due to any fault of its general engineering features, which were explained in this journal on Feb. 14, 1903, but to the unconstitutional character of the commission which the legislature established for carrying on the work. It is rather surprising that this undertaking has been hanging fire so many years while the important joint sewerage system for the district just south of the Passaic valley has been carried through to completion without serious delay. The trouble seems to lie in the difficulty of securing special legislation compelling communities to enter such a joint project against their desire and at the same time have such legislation constitutional.

A Brick and Reinforced-Concrete Warehouse has been built in Toronto, Ont., for Brown Bros. at practically the same figure as for slow-burning mill construction. The building is 192x42 ft. in plan with stories 10, 15, 14½, 13½ and 13½ ft. high from basement up. The floors are designed to carry 300 lb. per square foot and the columns are on 16x12-ft. centers. The columns are reinforced by steel rods at the corners, with a wrapping of expanded metal like the hoops of other systems of construction. The columns are connected by concrete girders reinforced with six rods near their bottom surface, some of these rods being bent upward at the ends. Instead of stirrups or loops, the girders have sheets of expanded metal at their ends. The floorbeams are of similar construction but smaller. The columns, girders and beams are of stone concrete; the floor is of cinder concrete with reinforcement of expanded metal in the lower part.

Notices of Danger and of the closing of a New York State road under reconstruction were posted by the contractors, but the public continued to travel over it. At one place there was a filling of coarse stone and cobbles about 15 in. deep, and in driving over it a teamster had a horse so badly injured that it had to be killed. The teamster had driven many times over the road after the notices were posted and construction was begun, and was familiar with its condition. He sued the contractors for damages, but has recently lost the case. The Supreme Court has ruled, 91 N. Y. Sup. 999, that where contractors reconstructing a road give a notice to the public that the road is in a dangerous condition and should be considered as closed, and a teamster has had actual notice of its condition by recent use, the contractors are not liable for the loss of a horse resulting from the use of the road while it is in that condition.

A Deficient Water Pressure in a street main at Lexington, Ky., on the occasion of a fire, resulted in a suit against the Lexington Hydraulic & Mfg. Co., which owns the waterworks there. The company has been successful in the Kentucky Court of Appeals, and the decision is given in 84 S. E. Rep. 774. The general law of that State in this matter is as follows: For breach of a contract between a water company and a city, in which the former stipulates to furnish a certain pressure for fire hydrants, the company is liable to an individual property owner for damages by fire from lack of the stipulated pressure. In this Lexington case, however, this general decision has been interpreted with due regard for natural as well as human laws. The contract requires the company to be prepared to throw six streams simultaneously from 1-in. nozzles on 2½-in. hose to a height of 80 to 100 ft. The court rules that this does not call for six streams from one street main, but merely six streams from different parts of the system, when, as in the case at issue, a pressure sufficient to throw six such streams from a 4-in. main would probably burst it, as well as most of the plumbing in the city.

The Appropriation of Water for the supply of cities far removed from the intake is sometimes claimed to be warranted on the basis of riparian ownership, because of the possession of the fee to the land on which the pumping station or other work is located. This has been denied in several states, and a short time ago the Supreme Court of Georgia made similar decision. In City of Elberton v. Hobbs, 49 S. E. Rep. 779, three points were settled in the following words: First, a municipality which buys a piece of land on a non-navigable stream several miles distant from its corporate limits does not thereby become entitled as riparian owner to take from the stream a supply of water for the inhabitants of the city. Second, the right of the owner of land through which a non-navigable stream flows to have its waters come to his land in the natural and usual flow is inseparably annexed to the soil, and is parcel of the land itself, and comes within the protection of the constitutional privision which forbids the taking of private property for public purposes without just and adequate compensation. Third, equity will enjoin a municipal corporation from taking a water supply from a stream in violation of the rights of a riparian owner, though he may not at once be seriously injured thereby.

RAISING THE GRADE OF GALVESTON.

Description of a Unique Hydraulic Dredging and Filling Work.

The raising of the grade in the area protected by the concrete sea wall recently completed at Galveston, Tex., to prevent the recurrence of a disaster similar to that which devastated the residence portion of the city on Sept. 8, 1900, is now being carried on at a rapid rate. The wall has been built for 3½ miles along the open sea side of the city to a national military reservation, and was described in The Engineering Record of July 4, 1903. The national government is now extending the wall past this reservation, making its total length when finished about 6 miles. The original design included backing the wall with a sand fill, 100 ft. wide at the bottom, 70 ft. wide on top and to its full height of 17 ft. This plan was afterwards changed by a commission consisting of Brig.-Gen. H. M. Roberts, U. S. A.; Mr. Alfred Noble, and Mr. H. C. Ripley, to include the raising of the grade of all the low area in the rear of the walls.

The grade raising was intended to provide not only a solid backing for the sea wall, but also to prevent water from the Gulf, in the most severe storms, from ever reaching a dangerous depth in this city, and at the same time to furnish sufficient elevation for the drainage and sewerage of that part of the city to the south. This section has an area of about 2 square miles and is below the main business portion, so that it suffered practically all of the damage incurred by the storm. The fill to be made over it averages a depth of 7 to 8 ft., but in places reaches a depth of 17 to 20 ft.

The island on which the city is built is a long low bar of fine sand and the bottom of the Gulf and the adjacent shores are of the same material. This sand is particularly well adapted for making the fill, but the available sources were so located that an economical method of moving the sand from them to the low ground was a difficult one to devise. To excavate it from the area on the western side of the island was not feasible, as this is the only direction in which the city can expand, and to obtain the sand in that locality would have necessitated transporting it several miles. Even then large depressions at or below the extreme high water level would have been created and such results had to be avoided. As stated before, the area in which the fill is being made lies along the open sea side of the island and the excavation of such an amount of material from the bottom of the Gulf within a reasonable radius of the site of the work laid open the possibility of the same amount of material being claimed by the sea from the land, with a very great consequent danger to the sea wall, and even to parts of the city.

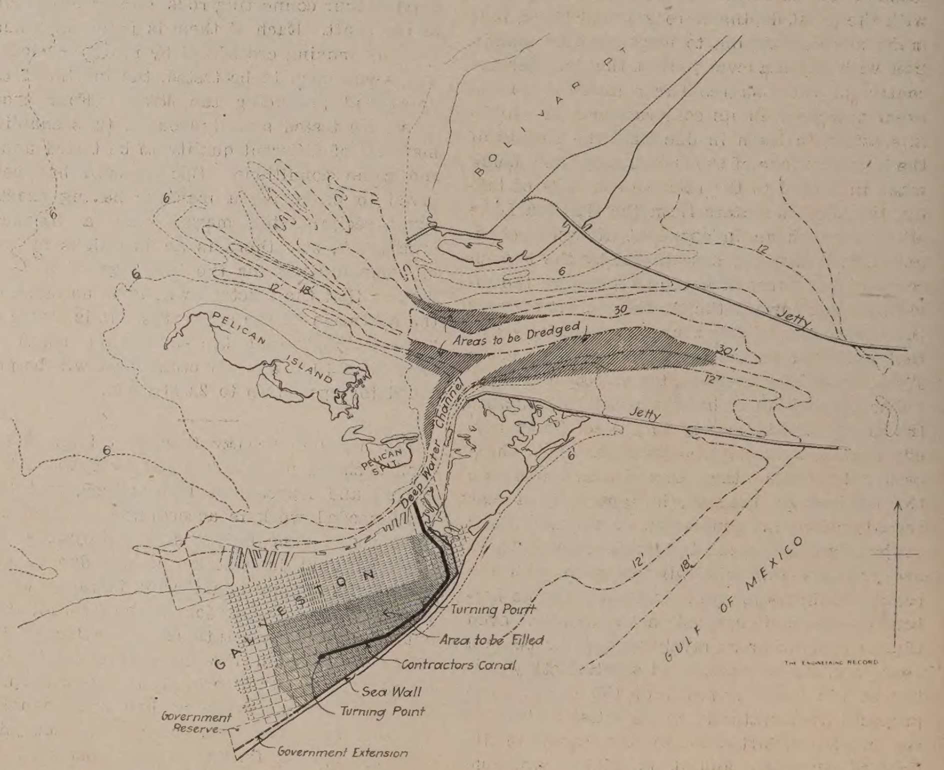
The waterways on the land side of the island have been greatly improved by the national government and private corporations. To excavate the required amount of sand within practicable working range of any hydraulic dredges in this country at the time the work was first projected would have seriously interfered with navigation and the commerce of the port. The most feasible site for making the excavation was along the channel at the inner end of the government jetties. The center of this area is about four miles from the center of the area to be filled, and beyond the limit of ordinary hydraulic dredge operations.

Of more than 200 contractors who were invited to submit bids on the work, but two responded. Goedhart & Bates, of New York City, offered to do the work for 18½ cents per cubic yard, which was 10 cents per cubic yard lower than the other bid submitted, so they were awarded the contract. For the success of this undertaking the personal experience of the contractors is a great guarantee. Mr. P. C. Goedhart is the senior member of Goedhart Bros., of Düsseldorf, Germany, which is one of the most important European dredging firms. They have been engaged on work in the harbors of Düsseldorf, Neuss, Leer, Papenburg, Kiel, Dantzig, Wilhelmshaven, Ruhort, and on the Dortmund-Ems and the Amsterdam-Rhine canals. Mr. Lindon W. Bates is the inventor of his well-known system of high-powered hydraulic dredges. He has been connected for twenty years with large contract works, such as the terminals at Kansas City, Mo.; Portland, Ore., Tacoma and Seattle, Wash., and the drainage canal of Chicago. He has, during the past eight years, designed or executed important harbor improvements or constructed machines of his system for the governments of the United States, Belgium, Russia, Egypt, South Australia, Queensland, and also for Calcutta and the municipal boards of other cities.

The contractors' plan, which is now being carried out, was to excavate the sand in the channel at the inner end of the jetties by hydraulic hopper dredges and to convey it in these dredges in a canal dug through the area to be filled from the land channel side of the island, to convenient points and discharge it from them over the area.

The idea of digging the canal through the city was a rather bold one, as may be seen from the accompanying map. The canal is 100 ft. wide on the bottom, with side slopes varying between 2 to 1 and 4 to 1, and has an average depth of 20 ft. of water, with a maximum width of 200 ft. at the water line. It commences at the junction of the government jetties and the sea wall just beyond the extensive water-front improvements on the land-side channel, and passing through a narrow space between a large hospital building and the sea wall, substantially parallels the latter structure within 200 ft. of it for about 10,000 ft. Its course then makes an angle of nearly 30 deg. with that of the wall, and it is continued 4,500 ft. further to a point a little over half a mile from the end of the area in which the grade is to be raised. The first part of the canal passes through a section that is fairly well-built up and several large structures had to be moved before the work could continue. Beyond its second turn the route lies through the residence district in which the houses were so completely washed away by the storm in 1900, and, as few substantial buildings have been erected in this section since then, slight obstruction from that source was encountered. About 150 buildings were torn down or moved before the canal was started. The city has leased the property through which the canal passes for a period of three years, with the privilege of extension in case the work is not completed at the termination of the lease.

The contract for digging the canal was sublet to Chas. Clarke & Co., for 7 cents per cubic yard. The material met with was fine sea sand, which was excavated with ordinary hydraulic dredges. The excavated material, in excess of that necessary to make the banks of the channel, has been placed back of the sea wall and over that part of the area adjacent to the canal. Approximately 1,500,000 cu. yd. will be removed in digging and finishing the canal, which is now advanced sufficiently for the operation of the hopper dredges.

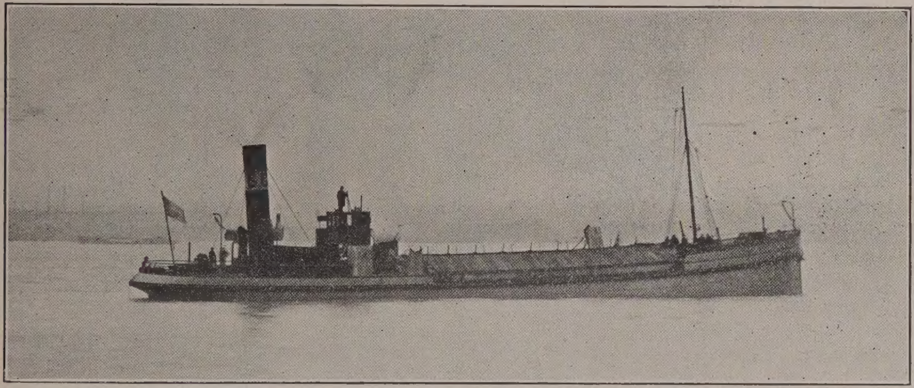


Galveston and Vicinity, Showing the Temporary Canal and Area to be Filled.

Three of the four hopper dredges which are to be used in the work are of unusual size and capacity and contain features of operation different from those of any dredges heretofore used in the United States. Their design has been developed in a few foreign shipyards where a number of dredges have been built to operate under conditions closely paralleling those existing at Galveston. The smallest is about 160 ft. long, with a breadth of beam of a little over 28 ft. Her hopper has a capacity of 500 cu. yd. and is filled with a specially designed 22-in. centrifugal pump and emptied by another pump of the same size and similar arrangement.

The other three boats each have a capacity of nearly three times that of the smallest boat. Their pumps are so designed, however, that by an original method of controlling the flow of material and water in the hold, one pump serves both to fill and discharge the load. One of these boats was built in Holland and the others in Dantzig, Germany, and all of them were brought to this country under their own steam. The smallest has been in operation at Galveston for some time, and one of the larger ones has also been placed in commission, while the others will be started at an early date. The third of the large boats was recently lost at sea, but another one will be sent to replace it. They are not like ordinary ocean steamers, as all their machinery, boilers, and coal bunkers, must necessarily be placed as far aft as practicable in order to give the greatest possible space for hoppers. They are tightly battened forward during the sea trip, but even then the risk of the journey is great. No attempt was made to have them built in this country as no ship building company here had built or could guarantee such craft. As the methods used in their construction were unknown in American yards, the risk of bringing them from Europe had to be assumed.

The small boat has been averaging about seven trips or about 3,500 cu. yd. every 24 hours. The larger boats each have a capacity of from 10,000 to 12,000 cu. yd. per hour. The boat that was lost at sea had a 43-in. pump and contained a 1,900-h.p. equipment, which gave her a capacity for discharging material through pipes over a mile in length. She was built at a cost of nearly $250,000. The other two large boats have 33-in. pumps, and the boat which is to replace the one that was lost will have a pump of the same size as these in order that their parts may be made interchangeable. The combined capacity of the fleet that will eventually be at work will exceed 37,000 cu. yd. per 24 hours, as a daily average rate of operation. The dredges are all built with hinged bottom hoppers, but these will not be used on the present contract, except, perhaps, toward the close of the work in refilling the canal.



The Smallest Hydraulic Steam Dredge Used at Galveston.

The excavation is being made at the inner end of the jetties in the three areas shaded on the accompanying map. The greater part of the sand will be removed from the largest area and will result in materially widening and deepening the channel. The dredges will discharge their cargoes from different points in the canal over the portion of the city in which the grade is being raised, which is also shaded on the map. The grading will be advanced in such manner as to cause the water to drain back to the canal and thus avoid any necessity for laying return drainage pipes. As the work is completed the canal will be refilled and its site brought to the same grade as the remainder of the territory, which is planned to have a surface slope rising 1 in 1,500 from the top of the sea wall.

It will be necessary to raise more than 2,000 private dwellings to the new grade. The larger and more substantial buildings, which it is more economical to raise than to tear down and rebuild, are being lifted by the ordinary methods of house-raising and new foundation walls are built under them before the grading work reaches their sites. As the buildings are elevated the sewers, gas and water mains, electric light and telegraph conduits will be adjusted to the new level. Such parts of the street railway tracks as lie in the newly graded area are also being raised as the work progresses.

The county of Galveston built the sea wall and contracted for the filling of the 100-ft. strip immediately back of it on a basis of 20 cents per cubic yard for the 713,750 yd. required to complete that part of the work. The remainder of the improvement has been undertaken by the city, aided by the State of Texas. About 12,000,000 cu. yd. will be required to raise the grade as planned, and nearly 15,000,000 cu. yd. will be moved, including the canal, before the project is carried out. The contract cost of the grading is $2,080,745, which is exclusive of the cost of the sea wall, the contract price for which was $1,198,000. The national government has appropriated $591,000 for extending the sea wall across its reservation, and the contract covering that work requires its completion before June 30, 1905. The territory back of this extension is to be filled, but no bids for that part of the work have been invited.

Parallel Running of a 5,500-Kw. Turbo-Generator.

About two months ago a 5,500-kw. 25-cycle Westinghouse-Parsons turbo-generator was put in operation in the 74th St. station of the Interborough Rapid Transit Co., New York. It was the first Westinghouse unit of this size to be put in service, although a number of similar machines are approaching completion. The next day after this machine was put in service, it carried loads as high as 8,000 kw., and for considerable periods loads between 7,000 and 8,000 kw. were of common occurrence. Some interesting facts concerning the running of the unit have been stated in the "Electric Club Journal," substantially as follows:

Within a few days after the machine was put in service, and while operating in parallel with six of the slow-speed, 5,000-kw. machines in the same station, a short-circuit occurred among the main leads at a point between the turbo-generator and the switchboard. This was a dead short-circuit and it tripped the automatic switches on all the slow-speed machines, which were set at almost three times full-load current, but did not trip the safety switches on the turbo-generator on account of the fact that the arc was so violent that it burned off the leads to the safety devices for this particular machine, though these leads were in a separate conduit. It was necessary to cut the turbo-circuits off by hand and the short-circuit therefore continued on this machine some little time before it was cut out. Careful examination of the generator showed that it was absolutely uninjured in any way, as far as could be determined, and was ready for service immediately afterward, but could not be thrown in with the other machines on account of the main leads to the switchboard being burned off. The machine has been in service with heavy loads since these leads were replaced.

The 5,500-kw. turbo-generator is run in parallel with the other machines in the station and the only notable difference in its operation and that of the slow-speed machines is due to the difference in the speed regulations of the two types of engine. The steam turbine was adjusted so that it regulated much more closely in speed than the low-speed engines, and, in consequence, the turbo-generator takes the fluctuations in load. It is noted that when the turbo-generator is operating in parallel with the slow-speed machines, the latter machines carry a much steadier load than when the steam turbine is cut out, the turbine unit appearing to take all the fluctuations when it is in circuit. This unit, therefore, has something of the effect of a flywheel or a storage battery on the system. This effect, if considered undesirable, can be modified readily by adjusting the speed characteristics of the steam turbine.

On account of its uniform rotative velocity and its relatively large flywheel capacity, the turbo-generator is particularly suitable for operating rotary converter systems such as the Interborough. Such machines also operate extremely well in parallel, and the operation of a steam-turbine unit with a reciprocating unit is, in general, considerably better than reciprocating units with each other, due to the fact that the mean rotative velocity of the combined units is better than in the case of reciprocating units alone. In the case of the Interborough slow-speed generators, this effect is not noticeable, as there is no evidence of periodic speed fluctuations in the slow-speed units, due to a large extent, to the heavy dampers on the machines, their large flywheel capacity, and the proportions of the engines which are designed for very small angular variation.

Some months ago a series of tests was made to determine the paralleling qualities of turbo-generator units. At full voltage the machines ran perfectly in parallel. Fluctuations in speed were so slight that periods from one to fifteen seconds could be obtained for synchronizing. When the voltage was reduced to 60 per cent. of the normal, the machines would carry the full current without any evidence of hunting. The voltage was further reduced and tests were made, until about 15 per cent. of the rated voltage was obtained. Under these conditions the machines still remained in parallel when carrying full-load current, but the conditions of paralleling were not perfectly stable, the load being transferred from one machine to the other at an irregular but not rapid rate. As the synchronizing power varies approximately as the square of the voltage, it was extremely low in the last test cited. It is evident, therefore, that but small interaction is required between such machines to maintain parallel operation.

The Erection of the Blackwell's Island Bridge—II.

Sixty-five Ton Derrick.—The 65-ton derrick used for unloading the material from the car floats at the Blackwell's Island dock and the one used on top of falsework at pier 2 for erecting the steel castings, first panel of floor and traveler No. 1 are duplicates of the two derricks used on traveler 1, and are rigged with ⅞-in. plow steel cables in the 12-part topping lift and in the 10-part hoisting tackles. The 22x24-in. rectangular mast is made with two built channels with their flanges turned inwards, and has top and bottom horizontal diaphragms affording bearings for the gudgeons. The bottom gudgeon is a 7-in. pin with a 4-in. center hole for the lead lines and is fitted to a casting about 2½ in. thick with a phosphor bronze spherical seat on the foot block. The top gudgeon is a 5 5/16-in. pin 4 ft. 2 in. long with two bearings about 27 in. apart.

The upper bearing plate is finished on top to a spherical surface with a radius of 10 ft. to receive the cast steel forked goose neck with a 13½x16-in. cross section in each arm, to which the tops of the stiff-legs are connected with two 3 11/16-in. pins each through their web plates. Jaw plates at the foot of the mast receive the boom pivot, and brackets riveted to its face near the top receive the pin for the topping lift link connection. The sheaves for the leads of the main tackles are set inside the mast and sheaves for leads of whip lines and auxiliary ropes are set outside the mast. The foot block is a 33¼x43½-in. steel casting 3½ in. thick with the top finished to a spherical concave surface, with a radius of 74-in. to fit the lower end of the mast and connected to the sills with twenty-eight turned vertical bolts.

The boom is made with two 29-in. built channels with their flanges turned in and latticed, and has a rectangular cross section 29½x30 in. in the center, tapering to 12x20in. at the heel and 15x18 in. at the point. It is made in two sections of nearly equal length spliced in the middle by four cover plates. It is stiffened with transverse diaphragms at both ends and in the center, and is pivoted to the mast by a horizontal pin through jaw plates on both members. The tackles are attached to it through long solid-link bars, which permit them to take small angles and allow it to be topped up into an almost vertical position.

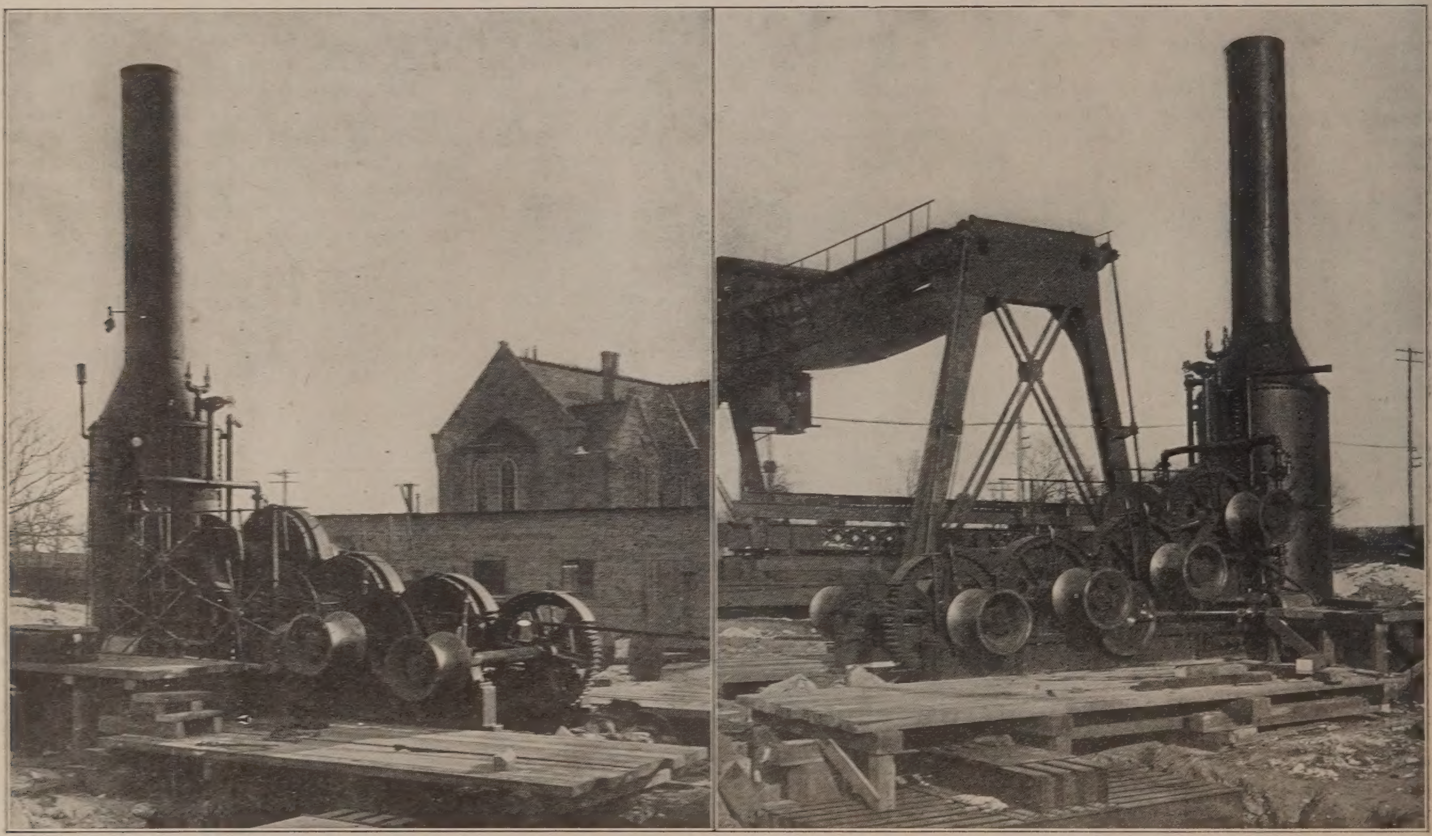
The sills have 27x26½-in. rectangular cross sections, and are made with four 6x4-in. angles turned out, latticed on all sides. They are bolted together at the foot of the mast and have pin connections to the feet of the stiff-legs. The stiff-legs are simple struts about 73½ ft. long on centers with 26¾x26½-in. rectangular cross sections made with built channels with their flanges turned out and latticed. Each channel is made with two 6x4-in. angles, one 26-in. plate and two 7-in. flange bars. At the foot of the mast the sills are riveted through their top and bottom flanges to the projecting top and bottom plates of the riveted pedestal, which form jaws engaging them. The pedestal is 26½ in. high with longitudinal and transverse vertical diaphragms, and forms a seat for the cast steel foot plate and a box for the sheaves over which the fall lines are led to the hoisting engine.

Traveler No. 1.—When the derricks are used on traveler No. 1 their sills will be seated on a simple rectangular platform and the masts connected by a horizontal top strut and X-bracing as shown in the front elevation. The platform will have double longitudinal sills 5 ft. apart on centers, connected by transverse struts and bracing. Each member of each double sill consists of a pair of 12-in. channels about 43⅓ ft. long, 10½-in. apart back to back, with their webs connected by diaphragms and their flanges connected by single lattice angles bolted across both members. Each member will have two double-flange wheels 6 ft. apart at each end on 5-ft. gauge tracks 40½ ft. apart c.c., thus making sixteen wheels for one traveler. The derrick sills will be supported on the platform sills by three transverse 15-in. I-beams at each end, two of each set being latticed together and continued across the platform to form the end transverse struts.

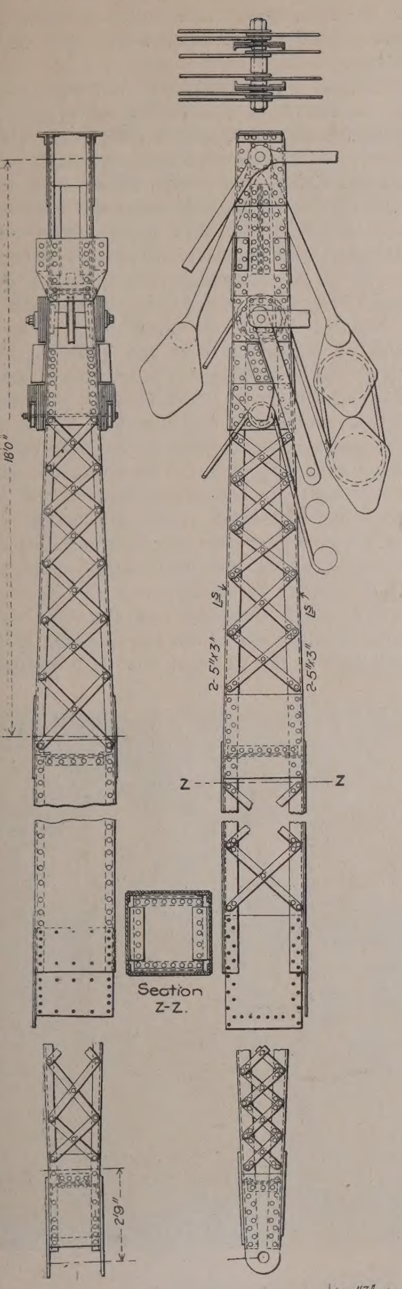
The forward end of the platform will have in the plane of the masts a heavy transverse strut, which consists of a double lattice girder about 4 ft. deep with T-shape top and bottom flanges, each made with two 6x4-in. angles and a 12-in. web plate. The diagonal members are single zig-zag 3½-in. angles and the ends have solid web plates, and are offset to make horizontal seats for the derrick sills, as shown in the general side elevation of the traveler.

When in use the forward wheels of the traveler will be lifted from the rails by 100-ton hydraulic jacks, set under the double girders and bearing on the transverse girders of the falsework. The jacks will be pumped up to give a considerable initial stress in the anchorages, which consist of pairs of loop ended vertical rods engaging pins through flat bars bolted to opposite sides of the girder webs. The vertical rods will pass through the double girders and be quickly adjusted by lever nuts on their upper ends which take bearing on the top flanges of the girders. These bearings and clamps will be at the extremities of the transverse girders, outside the traveler tracks, so as to give the widest possible lifting base; but those at the rear of the traveler will be in the centers of the tracks, and will each consist of two vertical screw ended rods with top and bottom nuts bearing on transverse yoke beams across the sills and the falsework stringers, the upper adjustments being made by lever nuts.

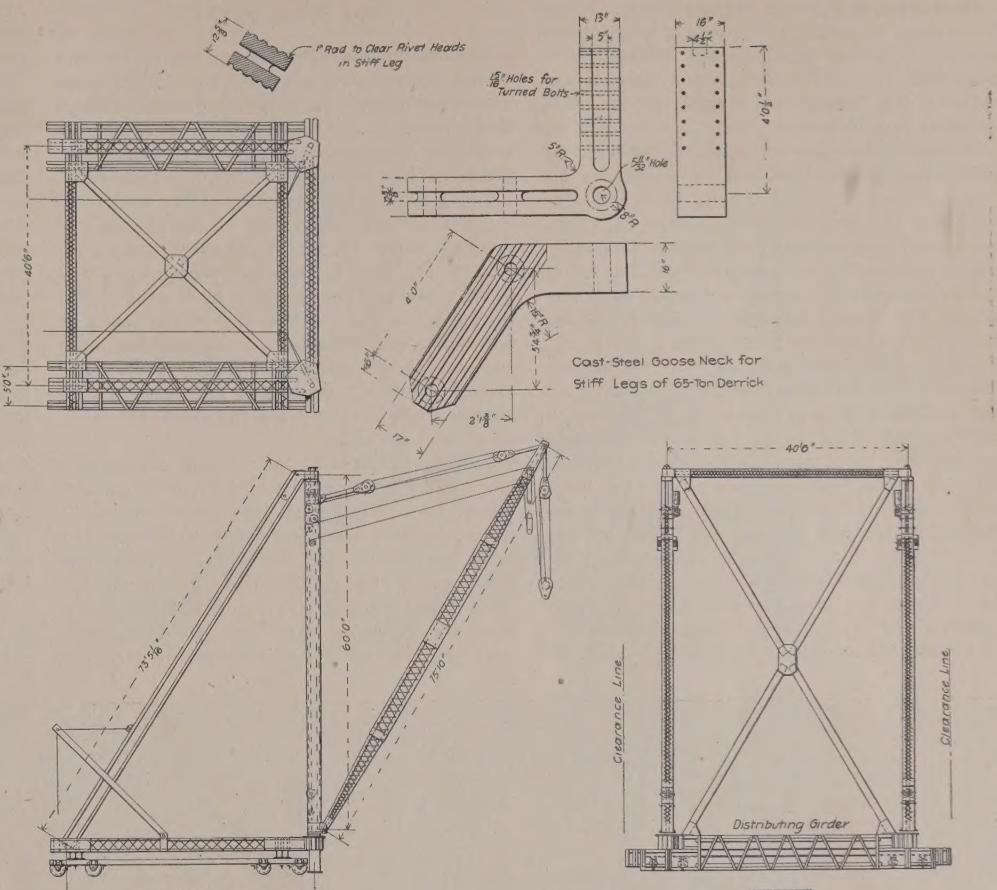
Each derrick weighs about 45 tons and the No. 1 traveler, without rigging, will weigh about 200 tons. The traveler will be operated by two special three-drum, six-spool hoisting engines weighing about 63,000 pounds each and built by the Lambert Hoisting Engine Co., Newark, N. J. These engines and their 100-h.p. boilers



Special Hoisting Engines for 65-Ton Derrick and Cantilever Travelers.

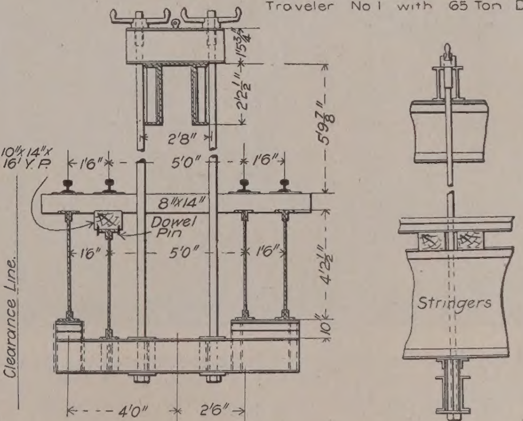


Boom for 65-Ton Derrick

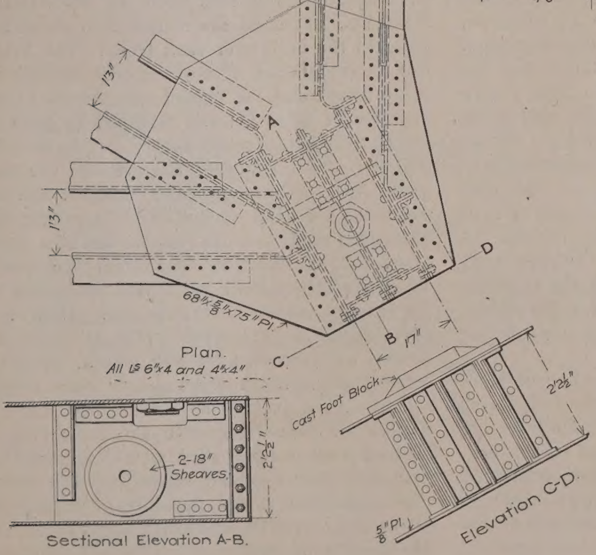


Cast-Steel Goose Neck for Stiff Legs of 65-Ton Derrick

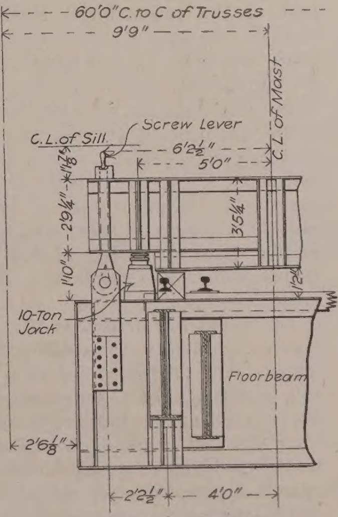
Traveler No 1 with 65 Ton Derrick Booms



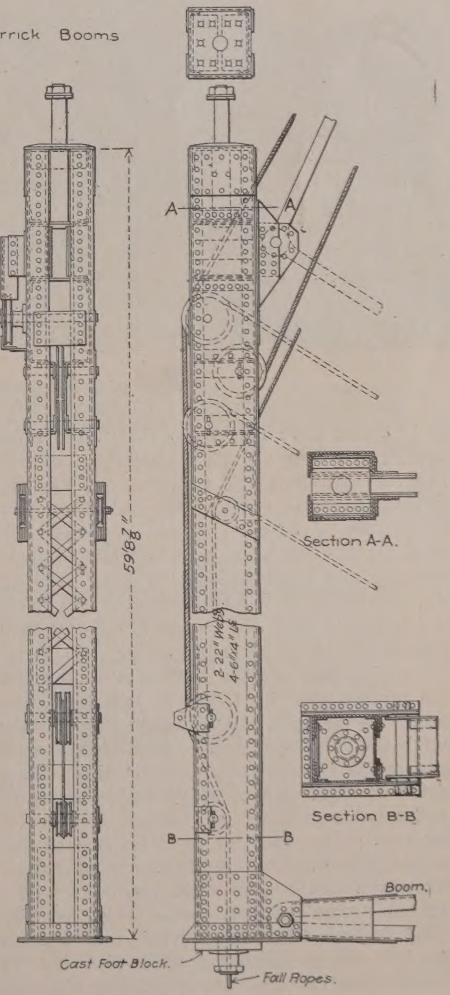
Rear Anchorage



Pedestal at Foot of Mast for 65-Ton Derrick.



Front Anchorage



Mast for 65-Ton Derrick.

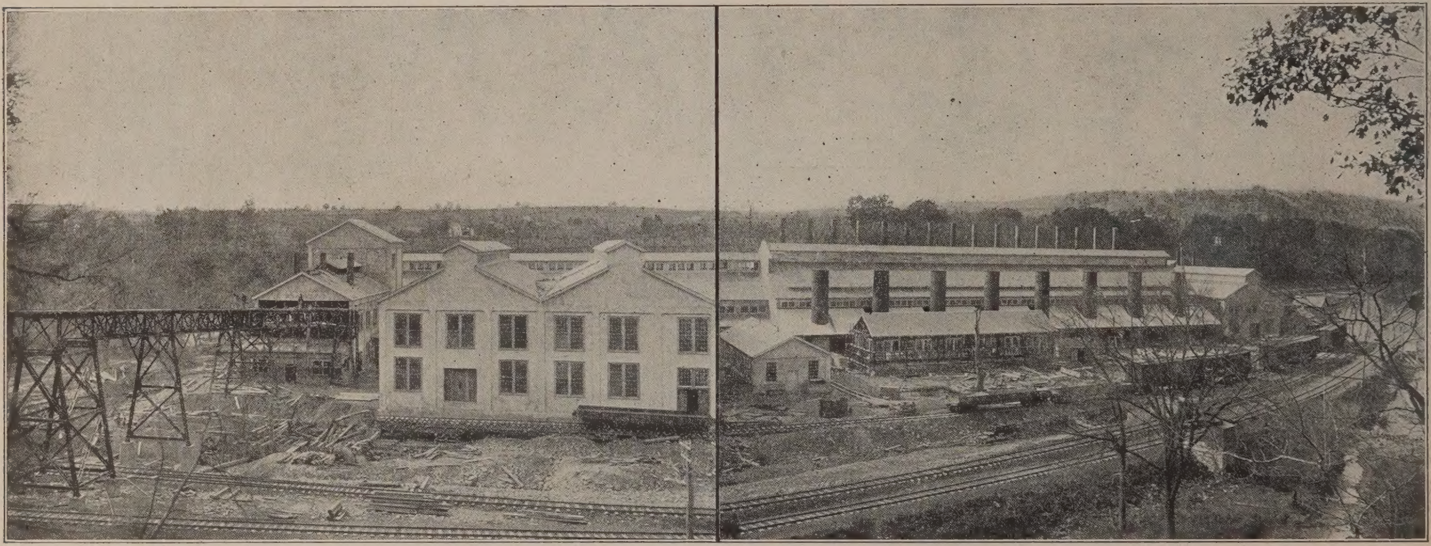
DETAILS OF 65-TON DERRICK AND FRONT AND REAR ANCHORAGES OF TRAVELER No. 1.

are carried on a separate 40½x39½-ft. steel platform moving in the rear of the traveler. It has a framework made with horizontal longitudinal angles and transverse I-beams, X-braced, covered with a solid deck of 3-in. planks and mounted on eight double-flange wheels on a track of 35½ ft. gauge.

Hoisting Engines.—The special features of the engines were developed in conference between the engineer and superintendent of erection and the manufacturers' expert designers, and are intended to cover several important points not usually satisfactorily provided for in ordinary standard hoisting engines. All of the drums and spools are commanded from one point, so that the operator controls every line without moving from his place; the clutches are operated by hand wheels instead of levers; they are held engaged by straight line toggles which insure holding on until the toggle is deliberately carried over the center, thus avoiding possibility of the numerous accidents which have heretofore occurred from the clutch accidentally becoming disengaged through the failure of the lock to work; the clutch most remote from the operator is connected with the controlling wheel by a pinion and long rack bar which provides positive and rigid transmission. The engine and boiler are mounted on a 7 ft. 4 in.x21 ft. 10-in bed, and have four main shafts, the three nearest the boiler having 18x42½-in. drums. The forward shaft has no drum, but like the adjacent one has a spool at each end. The other two shafts have spools at one end only, the spools at the other end being omitted to make room for the operating hand wheels. The engine has two cylinders 12½x16 in. in size and it is geared 5:1 and will pull 15,000 lb. on each line.

Six of these hoisting engines are provided, two for traveler No. 1, one for the unloading derrick on the dock, one for hoisting steel to the top of the falsework in the center of the island span, and one on each of the cantilever travelers, which are also each provided with a standard eight-spool engine without drums, for operating the tackles used for lighter members and auxiliary purposes. There is also another Lambert engine and a Lidgerwood engine, each having two drums and four spools, which are provided for the falsework traveler and for the standard 30-ton stiff-leg derrick with a 62-ft. boom which is seated on top of pier No. 2 to erect the first panel of the falsework and to assemble traveler No. 1 on it.

(To be continued.)



View of the National Portland Cement Works from the Site of the Cement-Rock Quarry.

The National Portland Cement Works, Martins Creek, Pa.—I.

A Portland cement plant of unusual interest in several respects has been erected for some months, though not fully completed, at Martins Creek, Pa., by the National Portland Cement Co. It was designed for 3,000 bbl. output per day, sixteen rotary kilns, each rated at 200 bbl., having been installed. The works are comprised in a relatively compact group of concrete buildings, which exhibit a notable attention to good appearance, especially for a cement plant, as they have been constructed with the walls coved outward at the eaves of the roofs, with paneling in the exterior walls and with light dull-green window sash. The extensive use of concrete is regarded as consistent with the business in which the company is to engage.

General Features of the Works.—As regards the arrangement and equipment of the plant, which, it is worthy of note for the capacity stated, is built upon 5½ acres of ground, the following are the chief features: Electric driving has been employed throughout, with direct-current distribution, and, in practically every case, motor rooms have been provided, with the motor shafts extended through the partition walls to the machines driven. The grinding machinery has been laid out so as to allow, among other things, for readily transferring a part of the raw-material machinery for the clinker finishing, and vice-versa. The rotary kilns, though 60 ft. long as installed, will allow for extension in length. The design of the power plant has included modern adjuncts generally ascribed as offering economy and convenience of operation, and it is itself a conspicuous part of the works. The various departments are all connected by underground tunnels of relatively large size, for the carriage of the many conductors needed for the distribution of light and power from the power-house switchboard.

The works are located in the valley of Martins Creek, immediately below the hill slope, which, with the exception of a thin layer of soil, is entirely composed of cement rock carrying approximately the correct proportions of lime, silica and alumina for a Portland cement. Owing to the fact that at certain seasons of the year the creek carries abnormal amounts of water, the works are about 14 ft. above the natural ground level. For the fill necessitated the earth was obtained without great inconvenience from a slope on the opposite side. For the foundations and buildings altogether about 130,000 bbl. of cement was used in the concrete.

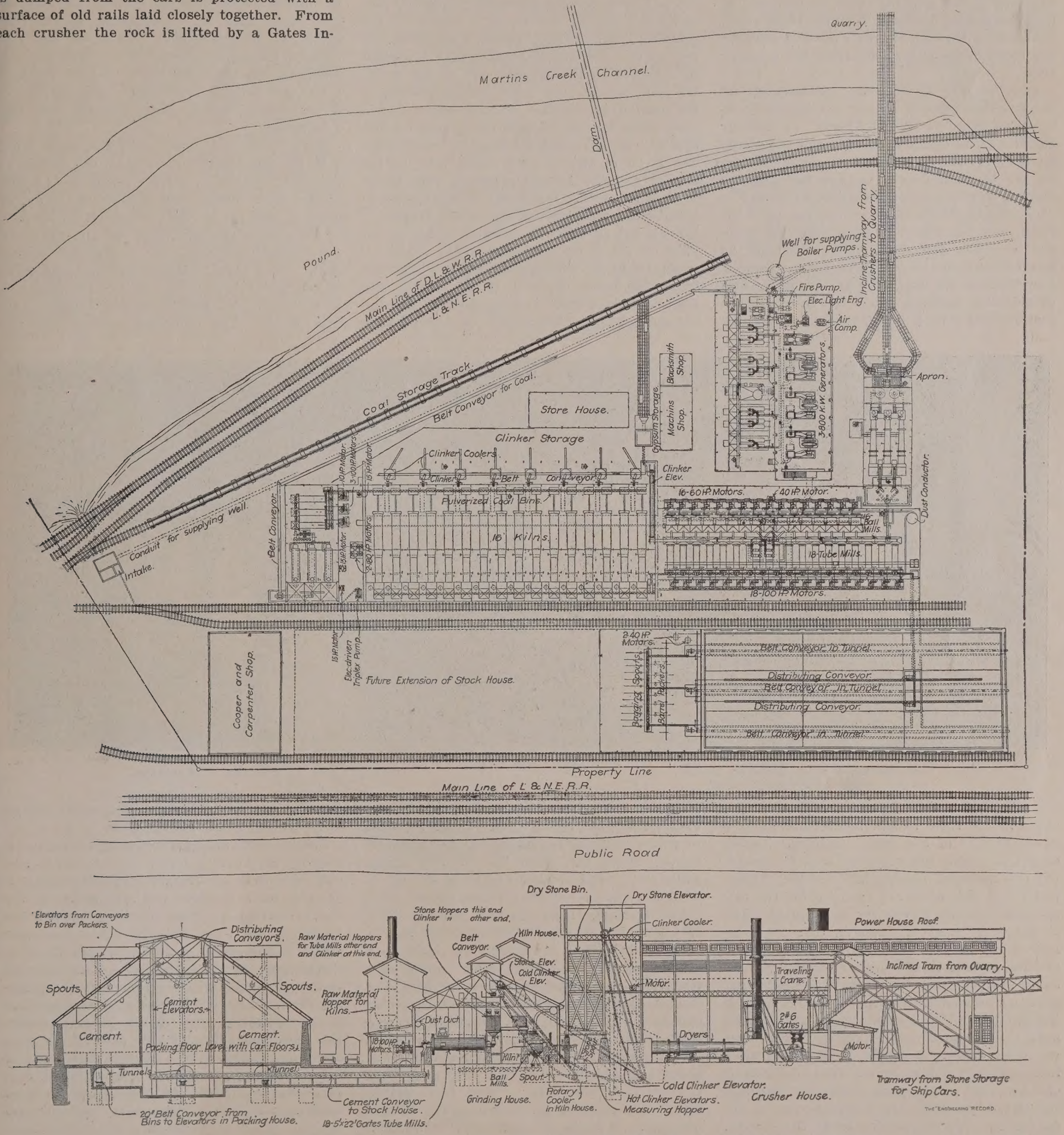
The plant is arranged on a level tract, at the base, as stated, of the hill where its raw materials are obtained, and a steel-frame bridge serves to bring the rock from the quarry into the stone house. The stone house is an L at one end of the grinding room; the kiln room lies in a direct line with the grinding room, while the cement stock house lies on the opposite side of the grinding room from the stone house. Both the raw and the finished materials are handled in one grinding room, and the course of materials from the quarry to the stock house is through the stone house, grinding room, kiln room, back through the grinding room, and finally into the stock house. The power plant is situated in a relatively central position with respect to the whole works, while the coal mill for the preparation of the pulverized fuel is located at the end of the kiln room. A detached store house, a detached machine shop, and a detached cooper shop complete the colony of buildings.

Cement Rock Handling and Crushing.—The general construction of the raw-material bridge is indicated in the photographs. It is equipped with side-dumping cars built by the John A. Mead Co., and these are attached to an endless cable in the middle of each track. The bridge has an inclination of 6½ per cent. toward the stone house, and the loaded cars, which have a capacity of 6,000 lb., are designed to haul the empty ones back to the quarry. It is intended that the cars in rounding the curve at the stone house will be automatically dumped without stop. At the head of the bridge arrangements have been made for the installation of a motor drive for hauling the cars from the quarry when the latter shall have been excavated below the elevation of the bridge. It will be necessary to maintain the bridge at its present height, as it crosses railway tracks, which lie between the works and the quarry sight. These railway lines, it may be stated here, give facilities for connecting with the Pennsylvania, the Delaware, Lackawanna & Western, and the Lehigh & New England railroads. The bed of the creek also skirts the hill at this point. While the rock will ordinarily fall directly into the mouths of the crushers, it is intended to provide a covered store for the rock immediately outside of the stone house proper, so that a supply will be available during inclement weather, when the quarry cannot be worked. An inclined tramway will be erected for lifting the stone from the storage to the crusher apron at the point where the quarry cars ordinarily discharge.

The stone house contains two No. 6 style D Gates crushers, mounted on concrete foundations. The inclined apron upon which the rock is dumped from the cars is protected with a surface of old rails laid closely together. From each crusher the rock is lifted by a Gates Invincible elevator to two bins supplying the dryers. Each crusher and the corresponding elevator is driven by a 60-h.-p. motor, and the two motors are housed in an extension to the stone house, as indicated in the cross-section drawing.

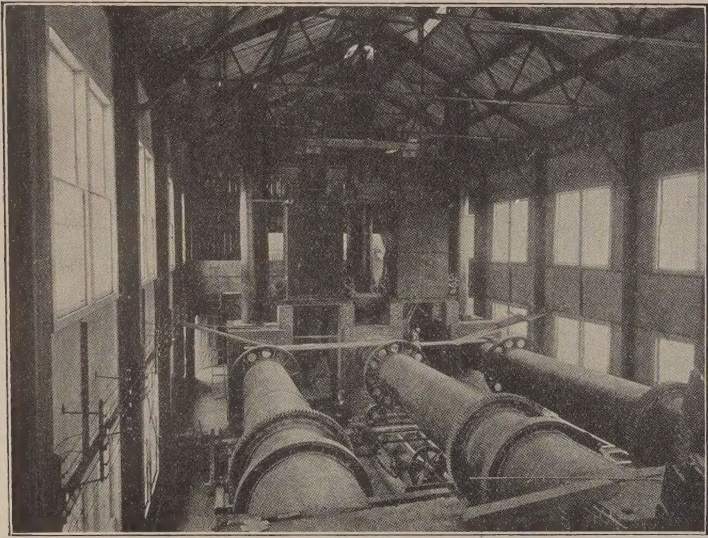
There are three dryers, of the Allis type, 40 ft. long and 40 to 65 in. in diameter. Two dryers are intended for the cement rock and the other for limestone for a few hours each day, while the remainder of the time it is to be employed on cement rock. Each of the two crushed stone bins is fitted with a feeder on each side, the feeders being the Gates style H wall-type, so that each bin can feed into the middle dryer and the adjacent outside dryer. The arrangement is shown in an accompanying reproduction of the photograph looking from the delivery end of the dryers toward the crusher end of the building. The three dryers are all driven at about 4 r.p.m. from a 15-h.-p. motor, which is located in a small house built outside of the building. The shaft runs underneath the three dryers with chain drives, as shown in the half-tone, with a clutch for throwing each dryer upon the shaft.

The dryer plant is designed on a 10-hour working basis, as usual, while the kiln and grinding departments are planned for continuous operation. The delivery end of the middle dryer is arranged to throw the dry stone in either direction, as there are two dry-stone elevators, located on either side of the central dryer, which elevators lift the dry material a distance of 63 ft. to the dry-stone bins. One of these elevators is to be used exclusively for limestone during the time that the one outside dryer is being used for that stone, the discharge of the central dryer being all shunted to the opposite side into the other elevator.



Plan of the Works and Cross-Section on the Line of the Crusher House and Incline Tramway.

The bins are of 500 cu. yd. capacity, constructed of planks in the regular form for stone bins and have flat bottoms of 16-in. plank placed edgewise. From the bottom of the bins are stone spouts: two deliver cement rock and the third limestone into a measuring hopper, where a mixture according to volume measurement is made. From the measuring hopper the mixture of raw materials is elevated to a point overhead in the grinding room, as indicated in the cross-section drawing. With the exception of the opening through the wall for this elevator, the stone house is separate from the grinding room.


Stone Dryers in Crusher House.

Rotary Kilns in Process of Erection.

The Grinding Room.—The arrangement of the grinding room is one of the especially interesting features of the plant, as already stated. Along one side of the room are placed all the tube mills, while on the other side are all the ball mills, both for the raw and the finished products. The elevating machinery is very largely all placed about the center of the room, and the design is particularly noteworthy from the absence of obstructions on the floors by which the workmen can be injured. For example, the tube mills are supported at a considerable distance above the floor line, so that one may walk the entire length underneath the tube mills without trouble, while every machine in the room is individually driven by a motor outside of the room. Ordinarily, seven of the ball mills are regarded as sufficient for the raw material, leaving nine for the clinker, and seven tube mills are reserved for the raw material, leaving eleven for the cement. The arrangement is such, however, that the progress of the material through the room is continuous, the set of ball mills nearest the stone house taking care of the stone and the farther group of tube mills receiving the products from the raw ball mills; and similarly the ball mills nearer the kiln house receiving the clinker, which in turn is delivered to the tube mills farther from the kiln house. One tube mill or one ball mill at the point where the raw and the clinker batteries are adjacent may be put on the raw-material service or on the clinker, as desirable.

The handling of the material in this room is, in brief, as follows: The dry stone elevated from the measuring hopper in the stone house is dumped upon a belt-conveyor, which runs longitudinally underneath the monitor of the room, opposite the seven raw ball mills reserved for the crushed stone. It is provided with the usual tripper to deliver into any one of the stone hoppers above each ball mill. At the end, in order to deliver to the eighth ball mill, when desired, in accordance with the arrangement mentioned, an extra chute is provided. Each of the ball mills is of the No. 8 Gates pattern, and is direct-driven through spur gearing from a 60-h.-p. motor. The belt and various screw conveyors were furnished by Stephens-Adamson Manufacturing Co.

The sixteen motors necessary for the sixteen ball mills are all housed in a lean-to to the grinding house. This motor installation, as well as the corresponding one, which is located in a lean-to on the opposite side of the grinding mill, for the tube mills, constitutes one of the exhibition features of the works. Concrete piers for the support of the motors and bearings are distributed along the inside wall, and steps in the concrete work lead to the motors and the individual panel with which each is provided. When anything happens to a particular machine and the circuit-breaker is thrown out by the mill operator inside, a red light on the panel announces to the motor attendant that the corresponding motor must not be started until the mill runner inside has remedied the trouble and signaled by turning out the red light. The switch on each panel is of the type which can only be thrown in step by step, so that the attempt cannot be made to throw out the resistance in the armature circuit before the motor has attained speed, while the circuit breaker cannot be thrown in until the switch has been thrown open.

The discharge from the ball mills is delivered directly into a longitudinal screw conveyor which leads underneath the mills to a central point in the room where there is a transverse screw conveyor below the floor line. This leads to a duplicate installation of bucket elevators which, at the top, deliver to an overhead transverse screw conveyor. The latter, in turn, discharges into a longitudinal screw conveyor extending over the hoppers for the raw-material tube mills. There is a similar installation of screw conveyors for the finished material. In other words, there is a screw lying longitudinally underneath the clinker ball mills. This and the corresponding screw for the material from the raw ball mills feed in opposite directions toward the transverse center line of the room. Here the former also delivers into a transverse screw under the floor, and then into a pair of elevators, an overhead transverse screw, and finally an overhead longitudinal screw, the last extending away from the center line over the bins for the cement tube mills. There are thus two underfloor transverse screws at the center of the room, one for the ground rock and the other for the ground clinker; and two bucket elevators in each case, the four bucket elevators rising in a group between the two sets of tube mills. In order that the two ball mills on opposite sides of the transverse under-floor screws may be employed to handle either rock or clinker, as desired, they each have two discharging spouts, one delivering to the ground rock screw and the other to the ground clinker screw. The crushed stone having been distributed to the raw-material tube mills, is discharged from them into a longitudinal screw, which delivers into the kiln house.

Each of the tube mills is of the Gates type, 5 ft. in diameter and 22 ft. long, and is direct-driven by a 100-h.-p. motor. These motors are located in a motor room similar in its equipment to that for the ball mills, but on account of the greater size of motors, the concrete piers are of heavier proportions. It should be stated that, with a view to improving the appearance of the motor rooms, the ceilings are sheathed with narrow pine boards varnished with a natural finish. The reduction gearing includes phosphor-bronze pinions on the motor shafts and cast-iron gears, all cut teeth.

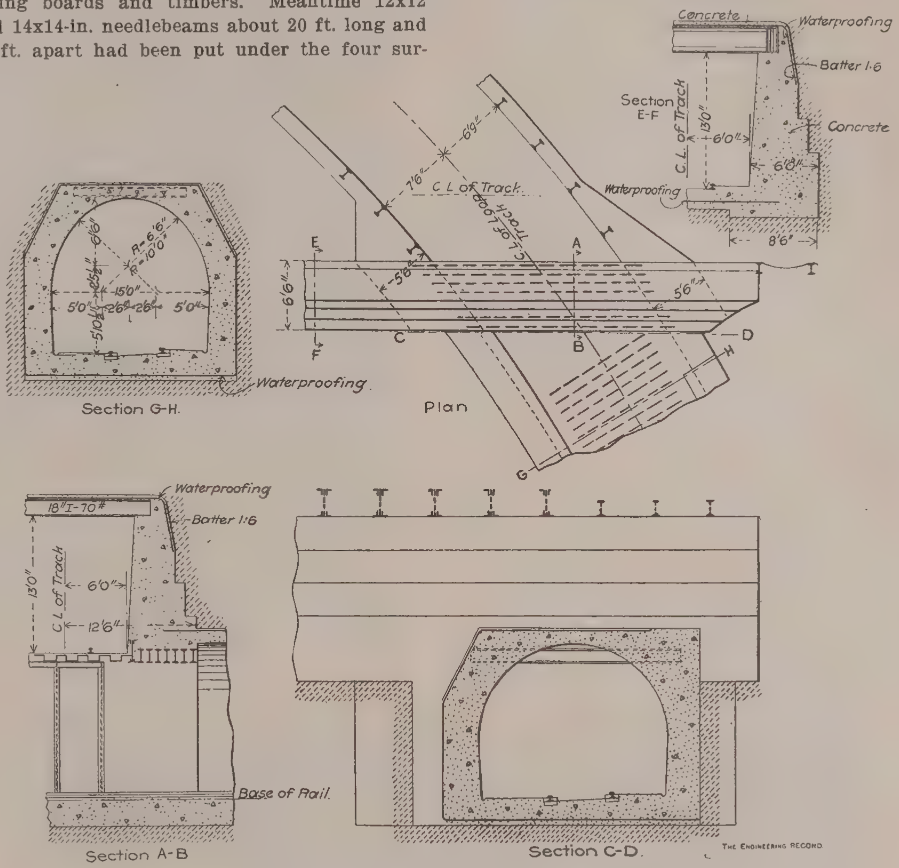
Special gates are provided at the hoppers delivering to the tube mills. Among other special features is an overhead tramway which is designed to run across the tube mills for the ready delivery to them of the pebbles. The height of the tube mill above the floor also makes it convenient to discharge upon the floor the contents of the tube mills. It is intended to install a dust-collecting system in the grinding room, which will include a 10-in. air-suction pipe immediately above the top opening of each ball mill, and a 6-in. branch exhaust air pipe above the discharge end of each tube mill. A set of lateral pipes for the ball mills will connect into one trunk and those from the tube mills into a second trunk duct; and the two trunk lines are to be joined to the suction inlet of centrifugal exhausters and cyclone dust collector. It is believed that this system will do much toward keeping the grinding room free from dust. The central group of elevators and conveyors for transferring the ground material from the ball mills to the distributing screws over the tube-mill hoppers, are all driven from a 40-h.-p. motor in the ball-mill motor room.

(To be continued.)

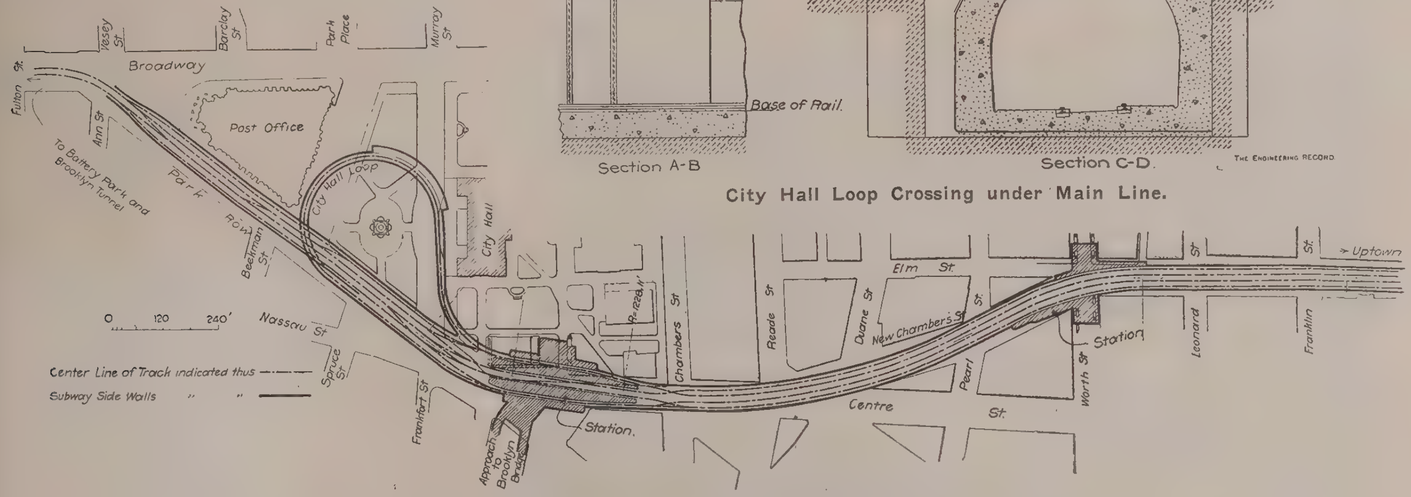
The Construction of Section I, New York Rapid Transit R. R.

Section 1 of the New York Rapid Transit R. R. extends south about 1,400 ft. from Chambers to Ann St., and connects the four-track uptown structure with the two-track structure to the Battery Park and Brooklyn tunnel. It includes the City Hall Loop and station, and the Brooklyn Bridge station and, except for the irregularities caused by these structures, is a four-track structure with concrete walls and roof and steel roof beams and four longitudinal rows of columns. The average width and depth of excavation was about 75 and 25 ft., except for the loop, which was narrower and about 40 ft. in depth to allow its tracks to pass under those of the main line. The material encountered was all clean, dry, sharp sand which was easily retained with moderate sheeting and bracing and required no draining except for the removal of surface water.

The construction of this section was one of the most costly, difficult and tedious of all the subway sections on account of the tremedous traffic between the entrance to Brooklyn Bridge and Broadway, the proximity of two of the tallest buildings in the world with footings on the sand several feet above the subway excavation and very close to it, and the complications involved by the stations and the loop. Notwithstanding these difficulties the work was successfully accomplished safely and steadily by ordinary simple plant and methods, without seriously obstructing the traffic, small sections being done at a time and great care being exercised to safeguard the public and make every part of the work secure as it progressed. In general the system was that of shallow tunneling from narrow open trenches without disturbing the street surface, excavating the tunnel floor to sub-grade, supporting the surface tracks on needlebeams and handling spoil and steelwork by cableways.



City Hall Loop Crossing under Main Line.



Section One, New York Rapid Transit R. R.

Temporary plank pavements have been found so unsatisfactory under very heavy traffic elsewhere in the subway construction, that it was in the outset determined to maintain the use of the original granite block pavement on its concrete foundation above the subway structure. The first excavation was made between Mail St. and the Mall, where a trench about 12 ft. wide, 10 ft. deep and 200 ft. long was dug and a 300-ft. Cherry-Laurent Cableway, made by the Spilsbury Engineering Co., was set up over it about on the line of the west curb of Park Row. The sides of the trench were sheeted with 2-in. boards, and 5x5-ft. transverse drifts, about 10 ft. apart on centers, were driven about 50 ft. eastwardly from it to the east line of the subway excavation. The drifts were made in the usual way with timbering and poling boards, and after they were completed cap timbers were set in each and were supported on vertical posts wedged up to carry the upper timbers and roof boards.

The earth between the drifts was then excavated by transverse digging under poling boards and the full width of the subway was excavated between levels 3 and 10 ft. below the surface of the street, the pavement, foundation and about 2 ft. of earth being supported on the poling boards and timbers. Meantime 12x12 and 14x14-in. needlebeams about 20 ft. long and 10 ft. apart had been put under the four surface tracks, each timber usually supporting two tracks, and supported by vertical shores at the ends and in the middle by cribbing and by vertical shores which were at first in short lengths and were replaced by longer and longer pieces as the excavation was deepened, the needlebeams supporting both tracks and poling boards.

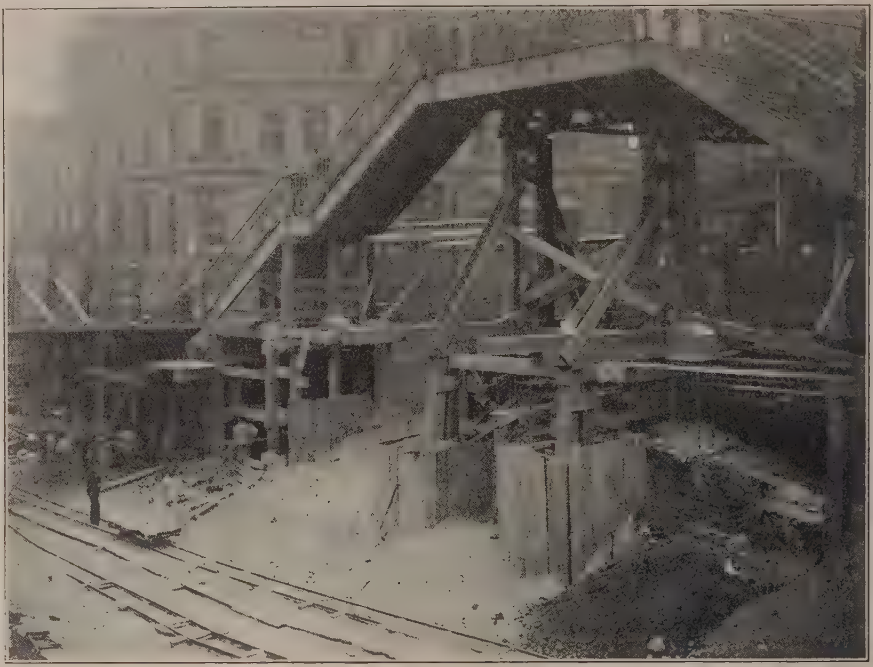
After the first 200 ft. of the upper part of the excavation was thus made the method was somewhat modified by drifting longitudinally the full width of 60 ft. from both ends of the excavation, and abandoning the alternating transverse drifts. The excavation was here made up a little higher, taking all the earth to the under side of the concrete foundation for the pavement, and using the latter, supported on frequent horizontal timbers, instead of poling boards. This method secured more head room and saved holding up a considerable weight of earth beneath the pavement.

From Mail St. to Ann St. the cableway and open trench were located on the opposite or east side of Park Row because there were so many pipes and other buried obstructions that its trench could not be opened on the west side in continuation of the one first opened. After the excavation was completed full width to a depth of 10 ft. below the street, each end of each needlebeam was supported on a longitudinal beam carried on cribbing from the bottom of the trench or drift. The shores were released and 5x5-ft. pits were sheeted down about 15 ft. to sub-grade and permanent concrete flooring was laid on their bottoms. Full length timber shores were set on it to carry the needlebeams and the longitudinal timbers and cribbing were removed, the excavation finished full width to sub-grade, the concrete floor laid, the steelwork erected, walls and roof built and tracks and pavement supported on the new structure.

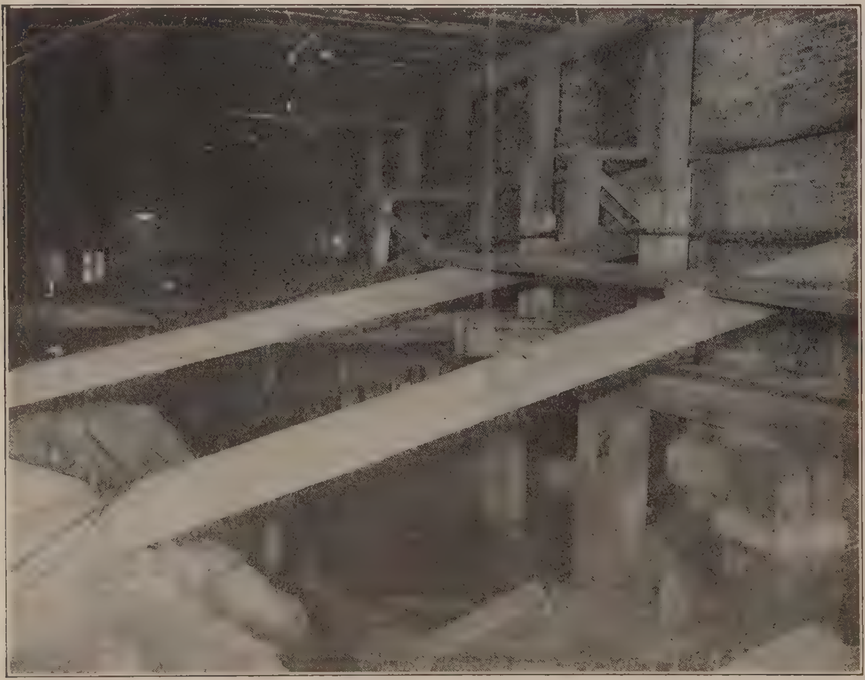
Between Chambers and Frankfort Sts. the column spacing is considerably increased on account of the station and platforms there and after the excavation was made down to 10 ft. below the surface, instead of making sheeted pits to receive the shores carrying the roof timbering and needlebeams, longitudinal trenches 5 ft. wide were dug to sub-grade on the center lines of the rows of columns and in them the columns were set, the transverse beams erected and the roof built before the remainder of the excavation was completed. This method obviated the long wooden shores and numerous sheeted pits and more quickly provided permanent solid support for the exceedingly heavy traffic at the bridge entrance.

Opposite the Hall of Records the steelwork was erected in successive longitudinal halves, on account of delay in the receipt of materials; elsewhere it was erected full width at once. Near the bridge entrance spoil and materials were handled by two stiff-leg derricks operated by two Lidgerwood hoisting engines; elsewhere they were handled by the cableways which delivered to and received from wagons at all times of day and night. The trench under the cableway was about half covered by heavy timber bridges for wagons and foot passengers, openings being left at intervals for hoisting and lowering. All excavation was made by hand and shoveled into 1½-yd. Stuebner steel buckets which were carried on 18-in. gauge tracks to the cableway. The sand excavated was of good quality and part of it was saved for use in concrete. Gravel was delivered in wagons and stored in piles in the excavation. Concrete was hand mixed at various points in the excavation and was delivered for short distances by wheelbarrows.

The clearance between the surface tracks and the subway was so small that the former sometimes had to be jacked up temporarily from 2 to 6 in. to erect the roof beams, and many pipes, conduits, etc., had to be temporarily removed. After the steel erection was finished the pavement was taken up, the earth under it above the subway was removed, and the street was carried on a timber deck blocked up from the steel roof beams. A few deck planks were removed at a time to permit the laying of the roof concrete which was often placed in a space 2 ft. high, by men lying on their faces. The surface tracks were always carried from the steel roof beams as soon as the latter were set, and were permanently supported on brick, concrete or rubble piers built on the roof, brick being used for heights of 2 ft. or less.



Supporting Brooklyn Bridge Terminal Platform.



Underpinning Vault Wall.

After the roof concrete was laid all the pipe and conduit system had to be reconstructed, new switch pits for the surface tracks made and drained and much other work of a similar tedious character done, which was so expensive that the finishing touches after the main structures were completed were almost as costly as the work previously done, the drainage alone costing about $8,000. In order to prevent the possibility of oil leaking into the subway the switch pit floor was lined with a double course of non-porous tiles laid in pure cement mortar.

The City Hall Loop is a single-track structure of different design from the rest of this section and is built with a monolithic concrete cross-section with the roof arch reinforced by transverse I-beams as indicated in section G-H. Where it crosses under the main lines the heavy side wall of the upper structure is carried on a set of I-beam girders which make a solid platform spanning the loop. Where the loop passed under the main subway the excavation for the former was spanned by heavy beams laid on the bottom of the upper trench and supporting the vertical posts which carried the surface track needlebeams and the pavement.

At one point the loop is partly under the outer portion of the two-story sidewalk vault of the Post Office building and its roof rises about 4 in. above the vault floor at one end and clears it at the other end. Here the method of construction was special and rather slow and difficult and care was taken to insure the stability of the vault and to interfere as little as possible with its tenants and the machinery located there. A temporary portion was built in the vault 6 ft. back from the retaining wall and part of the latter was torn down and rebuilt on top of the subway. Outside of the subway location the old vault wall was underpinned and retained. It was of rubble masonry, about 6 ft. thick at the top, 9 ft. thick at the base and 30 ft. high and was temporarily supported on cantilever needlebeams inserted through holes cut in the foot of the wall. The cantilevers fulcrumed on timber sills laid on the floor of the vault beyond the limits of the subway excavation and reaction was provided for by vertical shores wedged between the tops of the ends of the cantilevers and the floorbeams above.

In other places where the fulcrums could not be secured in the vault, the vault wall and roof were supported on beams carried at the inner end on horizontal sills laid on the vault floor close to the opposite wall or on vertical shores extending down to the bottom of the loop excavation. The outer end projected a few feet beyond the vault wall into a drift which had been tunneled parallel with the base of the wall and in which were laid sills to receive the beams. After these underpinning needlebeams were thus set, sheeting was driven in the drift just outside the vault wall and retained the earth while the excavation was made under the vault.

The subway excavation was made close to the Times Building and was carried below the foundations of its very heavily loaded piers with footings on fine sand. In order to prevent any danger of the sand flowing into the excavation and undermining the piers, the latter were protected by steel-channel sheet-piles driven by mauls to form a tight wall adjacent to the subway excavation and always kept with their lower ends at least 18 in. below the bottom of the excavation so as to seal it positively. When the subway structure was built the concrete was filled in against these channels and they were left permanently there.

Work on section 1 was commenced in the spring of 1901 and the main construction was finished in the fall of 1904, an average force of from 250 to 300 men having been employed on the work nearly all the time. The design and construction of the work were directed by the engineering department of the Rapid Transit R. R. Commission, Mr. W. B. Parsons, chief engineer, and Mr. George S. Rice, deputy chief engineer. The contractor was the Degnon Contracting Co., Mr. Francis D. Fisher, chief engineer.

The Foundations for the Hotel Albert, New York.

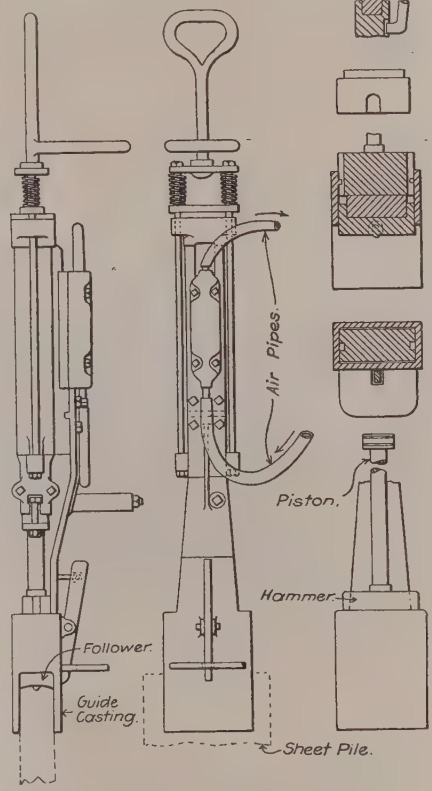
The old building for the Hotel Albert, University Place, New York, was a very well-built, nine-story structure with heavy brick walls supporting the ends of floorbeams. It was recently enlarged by a 40x100-ft. fourteen-story addition adjacent to the side wall. The steel columns for the new part are carried on separate concrete piers which, for the wall columns, also support brick arches carrying the brick work between the piers. Below the old cellar floors, there was a crust of hard fill 2 to 4 ft. in thickness, and about 25 ft. of exceedingly fine quicksand extending to the approximately level surface of bed rock, at a depth of about 40 ft. below the curb. Ground-water level was about 12 ft. below the curb, and to this depth the general excavation was carried.

An attempt was made to build the foundations in ordinary sheeted open pits drained by pumps; but after a number of months work was abandoned on account of the difficulties arising from the presence of quicksand. Steady pumping failed to drain the quicksand to any considerable distance from the pit in which the pump was placed. Several excavations had been made into which a considerable quantity of quicksand had entered, causing some settlement in the adjacent building and giving indications of a continued subterranean flow of the material. The situation was considered serious and apprehensions were entertained for the safety of the existing building, when a contract was let to Messrs. Clark & Co., 100 Broadway, to support the wall of the old building and to construct the foundations for the new one.

The basement of the building contained an unusually large quantity of mechanical plant, including elevator machinery, electric light plant and ice machine, so that it was impossible to support the wall on needlebeams while its foundation was rebuilt. The Breuchaud method of underpinning, by cylinders sunk in the plane of the wall, was also thought undesirable, not only on account of the time and expense involved, but because of the heavy unbalanced lateral pressure that would possibly be developed on the cylinders when the excavations for the adjacent column piers were made in the quicksand.

The underpinning was successfully accomplished in a simple, rapid and economical manner by stock ramming with the best quality of clay, such as is used for the manufacture of hard, red bricks. The clay was piled in heaps over steam coils and worked and cut with shovels until reduced to the proper consistency, and pounded in shallow wooden boxes from which it was removed as required by the cartridge makers, who rolled it like dough into 2½-in. cylinders about 8 or 10 in. long. These were placed in lots of 5 to 20 in a 3-in. pipe, which was driven in successive positions about 2 ft. apart and close to the wall footing, by a 2,500-lb. pile-driver hammer. The pipes were driven to solid rock in an inclined position, so that the lower end penetrated underneath the footing; the bottoms of them were notched so as to afford an outlet if the end of the pipe was in contact with the stone. They were usually, however, withdrawn 6 in. and partially filled with the clay cartridges on which was seated a plunger made of a section of heavy 2-in. pipe having short caps screwed on at top and bottom, each being provided with a ¼-in. hole at the center. The bottom cap was fitted with an outside hinged leather flap.

The 2,500-lb. hammer being lowered so as to rest on top of the plunger, forced the clay out through the bottom of the pipe and into the adjacent quicksand. When the plunger had descended to the bottom of the pipe, the hammer was raised and the plunger pulled up, the flap opening and allowing the pipe to vent itself. In this manner large quantities of clay were forced into the quicksand underlying the old wall and part of the site of the addition. The clay solidified the quicksand to such an extent as greatly to increase its bearing power and eventually to lift the wall. This work required a carload of clay per week.



Special Pneumatic Sheet Pile Driver.

Most of the concrete piers were carried down to the solid rock in open-sheeted cofferdams made with 4-in. tongue and groove yellow pine set up vertically on the surface of the ground and yoked together by temporary horizontal boards on the outside, so as to form the required rectangular walls. The sheet piles were then driven successively a few inches at a time by a special pneumatic hand hammer working around and around the full circumference of the cofferdam while the excavation was carried on by men inside. The pressure developed by the quicksand was so great that in some cases it bent the 4-in. sheathing between the heavy horizontal timbers only 3 ft. apart. As soon as a serious leak occurred the excavation was allowed to fill with water, and the leak was closed by driving several thousand cartridges opposite or near it. Most leaks occurred at the corners of cofferdams.

When this work was begun the lot was honeycombed with excavations previously made and with cavities resulting from the displacement of quicksand which had flowed into the former. Into one concealed cavity a man fell, breaking through the crust of the apparently solid ground, on which he was walking.

After operations were fairly under way and the conditions became well known, a rectangle about 6 ft. wider and 6 ft. longer than the proposed cofferdam was described concentric with it on the surface of the ground, and on these lines the stock-ramming pipe was sunk at intervals of about 2 ft., and large quantities of clay were driven into the ground, reaching to the solid rock. The clay was incorporated with the quicksand to such an extent that the cofferdam was sunk in the center without much difficulty and without causing a flow of the quicksand into the excavation. The mixed quicksand and clay formed a dense mass, which could best be excavated by a pick. In some cases the upper surface of the clay in the pier excavation rose at the center in a conical shape, indicating the great pressure applied by means of the rammer and pile hammer.

Eight of the piers were built on pile foundations. The piles used for them were specially designed and driven and were loaded to about 50 tons each. Each of them had a shell made with a single piece of welded steel pipe 12 in. in diameter, ⅜ in. thick. At each pier a hole about 4½ ft. in depth was excavated and enclosed by half-length sheeting driven and braced in the usual way. The pile driver was then placed over it and the steel pipes were driven by the use of a follower, which consisted of a 7½-ft. length of pipe of the same size telescoped over a 2-ft. length of slightly smaller pipe which projected 18 in. below the lower end and formed a pintle engaging the upper end of the driven pipe. The ends of the follower and the pipe made a butt joint covered by a 7-in. outside sleeve screwed to the lower end of the follower and projecting 3 in. below it, thus forming a socket in which the driven pipe was received. The upper end of the follower was capped with a heavy welded hammering ring through which a diametrical hole was bored to enable it to be readily lifted in the pile-driver leads.

The upper ends of the driven pipes were pierced with a ⅞-in. hole drilled to match a corresponding hole through the pintle in the bottom of the follower, enabling them to be bolted together so that the follower, with a pile attached, could be lifted by a tackle from the top of the pile-driver leads. After the pile had been set in place, in a vertical position, the bolt was removed and the pipe driven by light blows of the 2,500-lb. hammer and by scouring with a jet of water, which was delivered through a bent pipe and chisel-edge, heavy nozzle, inserted through a 3x18-in. vertical slot near the top of the follower, and manipulated while supported by a line from the top of the pile-driver tower. Better results were sometimes obtained by omitting the nozzle and discharging the jet through the end of the 2-in. pipe.

When the surface of the rock was soft or rotten, the pile easily penetrated it to satisfactory bearing and practically sealed itself. In some cases the pile encountered rock too hard to be penetrated, but in either case a satisfactory bearing was obtained by chiseling and by scouring thoroughly with the powerful jet, and then immediately changing the connection of the jet pipe to a tank of grout under air pressure. The grout having a greater specific gravity than the mud and water, completely displaced the latter and caused it to overflow through a 6-in. hole, to which a hose was sometimes connected just below the jet slot in the follower. When the pipe was filled with grout, the supply of the latter was stopped, the jet removed, and the pipe filled with concrete shoveled into the top, which displaced a portion of the grout and completely filled the pipe, enough grout remaining to fill all cavities in the concrete, thus forming a thoroughly solid filling for the steel shell.

The piles were cut before driving to such lengths that their tops reached a level of about 3 ft. below the bottom of the cellar excavation. The piles forming a pier were joined by means of a block of concrete, which extended a foot or more below the tops of the piles. All piers had grillages of steel beams embedded in the upper part to receive and distribute the column loads.

The records made by the contractors show that the wet quicksand had a weight of 110 lb. per cubic foot as excavated and 87 lb. when thoroughly dry. The extent to which cavities were filled and water expelled, by the stock ramming, is indicated by the fact that 220 cu. yd. of clay were used in the foundations and only 125 yd. of spoil were removed. The clay. after being made into cartridges weighed 130 lb. per cubic foot.

The work was executed during five months, commencing in December, 1903, under very severe conditions of weather. The plant installed was very simple. The principal machinery consisted of two pile-driving machines, a Rand air compressor, pneumatic tools made by the Chicago Pneumatic Tool Co., several Vanduzen steam syphons for draining the pits, a Davidson plunger pump and the pneumatic hammers used for driving the sheet piles. The hammer used here was designed by Mr. A. B. Clark and was built by the McKiernan Drill Co. This hammer is of simple construction, as shown in the accompanying diagram, and consists essentially of a pneumatic cylinder controlled by a piston valve. The hammer is forged in one piece with the main piston and its rod; it strikes upon a free follower contained in the forked casting, which embraces the pile and supports the cylinder. One side of the forked casting carries a step for supporting the operator. One man can move the machine from point to point, but two are employed in operating it. The hammer strikes, at the maximum, 500 blows per minute.

Grout was mixed in an elevated wooden tank having a valve outlet through which the grout was discharged into a funnel in the upper side of a horizontal steel cylinder, about 3 ft. in diameter and 7 ft. long, fitted with a crank shaft projecting through stuffing boxes at each end and having radial paddles between its bearings. The cylinder having been partially filled with grout and the inlet valve closed, the pressure of the air admitted to the upper part of the cylinder forced the grout out through a flexible pipe delivering to the pile. While this was going on the shaft and paddles were revolved continuously. The capacity of the cylinder was sufficient to fill one pile; its operation was rapid and satisfactory.

The work was done under the direction of Messrs. Buchman & Fox, architects of the building.

Progress on the Washington Terminal Station.

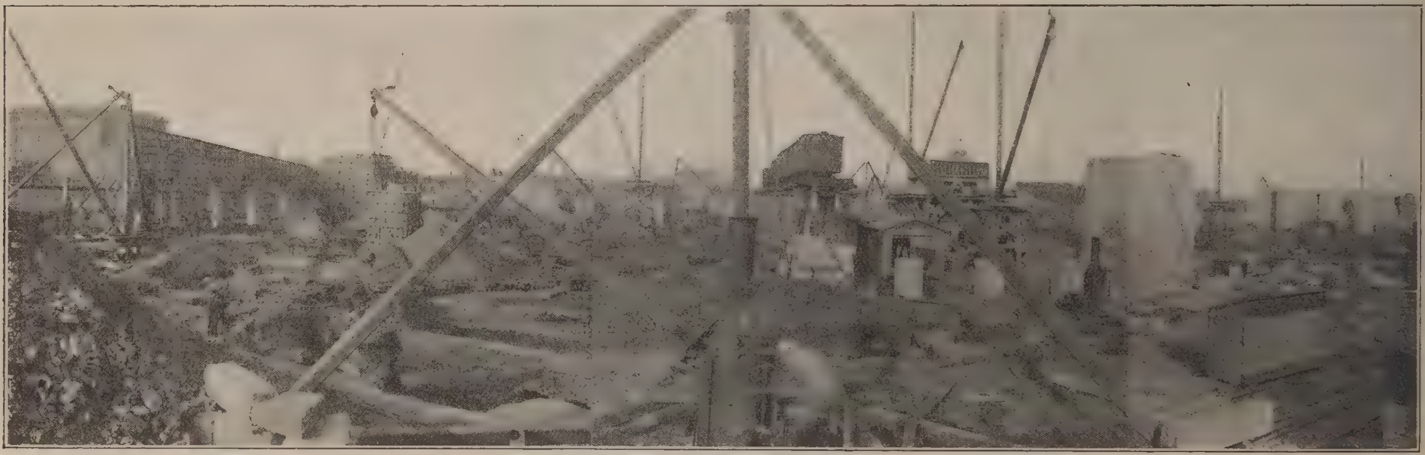
The station of the new union railway terminal at Washington, D. C., has extreme dimensions of about 340x780 ft., and is now being constructed by the Thompson-Starrett Co., New York, for a contract price of $4,500,000. The design was illustrated in The Engineering Record of Oct. 31, 1903, and the plant installed and methods adopted by the contractors for the construction of the sub-structure were described in the issues of Aug. 6 and 13 and Nov. 5, 1904. The foundations, piers and footing walls are of concrete, some sections of it being among the largest masses of the kind ever built. Single piers have dimensions as great as 40x50 ft. x 46 ft. high, containing 1,800 cu. yd. of concrete, and the total revised estimates of quantities give 750,000 cu. ft. and 500,000 cu. yd. of concrete, respectively, in the foundations of the building and in the approach work. The latter has been substantially completed, and about three-fourths of the former is now done, and it is expected that it will be finished in about two months.

The general system of construction provides for the storage of sand and broken stone in a long row of elevated, inclined-bottom bins, which deliver through chutes to cars taking the materials to the concrete tower, where cement is also delivered from a large storage house, and the materials are drawn from hopper-bottom bins to a series of gravity mixing hoppers, and from them delivered to special buckets and conveyed on radial, narrow-gauge, spur surface tracks to boom dericks, which empty their contents in the moulds. The plant was first installed at the east side of the site, and after completing the work within a convenient radius has been moved to the west side and reestablished much as before.

Notwithstanding the severity of the winter, work has been kept up except for occasional unusually cold days, by a force of about 200 men on the foundations and 1,000 men on the approach work, and a minimum amount of 500 yd. of concrete has been placed in 10 hrs., the men working single turn only, except when necessary to work double shift to complete filling an unfinished mould. The only precautions taken to protect the fresh concrete against very cold weather were in leaving the forms in place longer than in warm weather, until the concrete was very well set; in covering their tops with canvas and in covering concrete in trenches with water pumped in. The water might freeze on top, but did not freeze down to the concrete, and so kept it at a safe temperature, and was later pumped out again. No salt was used in the concrete, and no steam heating was resorted to, and the appearance of the concrete is reported to be entirely satisfactory.

About 1,500 tons of the steel superstructure have been erected, and work on setting the 4,000,000 cu. ft. of granite will be commenced as soon as there is no danger of more freezing weather. The concrete is made 1:3:5 with Lehigh Portland cement and 2-in. broken stone. The plant enumerated in our previous articles has been since augmented by the addition of five more derricks operated by Lidgerwood, Mundy and Lambert hoisting engines.

Messrs. D. H. Burnham & Co. are the architects of the building, and Mr. J. H. Giaver is the consulting engineer. Mr. W. A. Starrett is superintendent for the contractors.



Concrete Foundations for the Washington Union Terminal Station.

The Leakage of Boiler Settings was discussed at some length in a recent meeting of the Institution of Electrical Engineers of Great Britain. Mr. H. N. Holland said that the external brickwork was bonded to the shell of the boiler, which was bound to expand, and something had to go. A good plan, he felt, was to build the firebrick lining entirely separate from the external shell of the boiler. Another method he suggested was to put a second external shell around the boiler. This might be of expanded metal and, with an air space of 2 in. or 3 in., there would be an external shell comparatively cold. Mr. E. T. Ruthven-Murray said that he had put in glazed brick settings, the cost of which was not more than 12 per cent. above ordinary bricks, that they were of enormous advantage in reducing the amount of air leakage through the settings, and that if they did crack, the cracks could be seen and immediately filled. An advantage of the smooth surface was that the heat dissipation was lessened. With these settings, he said, it was quite common for the boilers to be pumped up with cold water and to find the full pressure with banked fires that had been standing 12 to 14 hr. The temperature of such a setting was 140° on the outside.

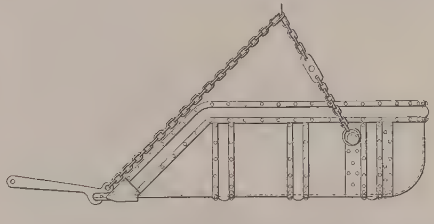
Erecting Radial Cableways for Gold Mining in Mexico.

The cañons of the La Brisca and the San Domingo Rivers interesect each other nearly at right angles in the state of Sonora, Mexico, about 55 miles from the nearest railroad station at Magdalena. At the intersection the San Domingo cañon is about 200 ft. wide with precipitous rocky banks about 100 ft. high diverging to a width of about 700 at an angle of about 30 deg. down stream. The similar La Brisca cañon is very tortuous, and about 600 ft. from its mouth makes a U-shape bend nearly at right angles to the San Domingo, and then resumes its original course upstream with a width sometimes not more than 50 ft. At the mouth it is about 50 ft. wide, but between that point and the bend it has a width five times as great. Both cañons are the beds of rivers dry, for most of the year, except for pools on the surface and a large supply of water flowing through the earth and gravel 20 to 100 ft. deep which overlies the vulcanic rock bottom. This loose upper strata is rich in gold, especially near bed rock, and a plant has been installed by the Green Consolidated Gold Co. to pump large quantities of water from a shaft sunk to bed rock and a tunnel driven from its foot under the gravel. This water will be used for sluicing the gravel which will be excavated in large quantities by a systematic system of stripping wide zones of the rock and back filling the gravel from them, after washing, in the pits made by previous adjacent excavations.

Hoisting Upper Story of Head Tower.

For this purpose the John A. Roebling's Sons Co., New York, has recently installed two 800-ft. radial traveling cableways, each of them with a capacity of 100 yd. of gravel per hour, and arranged so that both together can strip all the gold bearing gravel from the bottom of the cañons for a length of 1,600 ft. at one setting of the head towers. One cableway has the head tower set between the branches of the U-bend in the La Brisca cañon and extends through its narrow mouth to the opposite bank of the San Domingo cañon. The other cableway is approximately parallel and adjacent to it down stream, and has the head tower on a rock ledge about 20 ft. above the bottom of the San Domingo cañon on one side and the tail tower on the bed of the cañon at the opposite side, where the cañon is about 700 ft. wide.

Each cableway has a 2½-in. crucible steel cable 950 ft long with an ultimate strength of about 190 tons. The stationary 14x16-ft. pyramidal head tower has four 10x10-in. posts about 60 ft. high made in two pieces spliced in the middle. The movable tail tower is made with four two-piece inclined 10x10-in. corner posts, and also has intermediate posts. It has a 30x25 ft. base, is 40 ft. high and is mounted on eight double-flange wheels on a 35-ft. gauge segmental track. When in service the cable is anchored by guy ropes from the tower top to dead men or rock anchorages; but when the tower is shifted, at considerable intervals, these guys are detached and stability is secured for the unloaded cable by the 13 tons of rock ballast piled on the tower floor. Each cableway is provided with 15 scraper-shape 3½-yd. steel skips distributed on the bottom of the cañon between the towers and filled with gold bearing gravel by hand or by steam shovels. These skips are suspended from the trolley hoist by three chains, one of which is secured to an eccentric counterweighted hook engaging the lower front edge of the skip in such a manner that when the latter is seated on the ground the hook and chain are disengaged, and when the skip is hoisted again it is automatically dumped by revolving in the remaining two chains. Each skip is about 7 ft. square, 2 ft. deep and weighs, empty, 1,700 lb. The trolley has hoisting and traveling speeds of about 300 and 1,000 ft. per minute respectively and can make a round full-length trip in two minutes. They are operated by two-drum 50-h.p. hoisting engines of the cableway type.


Automatic 3½-yd. Dumping Skip.

The cableways, complete with the framed timbers for the towers, were shipped from the works at Trenton, N. J. This material should all have been awaiting the arrival of the erector at the La Brisca camp, but he found three-fourths of it still at the railway station at Magdalena, whence he transported it by ten-mule teams over a poor road, running most of the way in the bed of the San Domingo River between barren rocks, dotted here and there with tall sentinel-like cacti, about the only vegetation to be found there. The difficulties of erecting the cableways were largely due to bad roads, lack of materials and tools and the poor quality of labor, all that was available being half-naked greasers who could not speak English, and had the strength and intelligence corresponding with their habitations of mud huts and food of a few cents' worth of greasy beans per diem. Besides, all business is hampered and energetic constructors are sorely exasperated by the indolence and indifference of officials and all classes, who cannot be depended on for energetic or reliable services, and who by their invariable procrastination earn for the country its appropriate name of the "land of to-morrow."

Grillages 4 ft. square of 4-in. plank were built to support the tower posts, and in one case one bent for the lower story of the tower was assembled and bolted together on blocking on the ground, in a horizontal plane, and was revolved around its sill to its required position by windlasses. The ends of the horizontal and diagonal braces were bolted to it and supported temporarily by lines and tackles, while the remaining two posts were set up on end in their required positions on their grillage footings and secured by bolts to the opposite ends of the braces. The frustum of a pyramid being thus completed, the upper story of the tower was assembled complete inside of it by tackles attached to the tops of the first story posts, and was then lifted bodily to within 4 ft. of its required height by a tackle attached to the top of each lower story post and the bottom of each upper story post, most of the weight being lifted by two six-part tackles at opposite diagonal corners. Both their fall lines were taken to a hand windlass operated by four men, wound three times around the drum and tailed off to dead men, where the slack was taken up and they were snubbed by a man at each. Two four-part tackles on the opposite corners of the tower were manned by four men each, and were not used so much for lifting as to steady and adjust the tower. When the tower was raised until the tackle blocks jammed, it was supported on cribbing and jacked up the rest of the way, moved transversely until the upper posts were seated on the lower ones and the splices made. It took 20 of the inefficient laborers 6 days to erect one tower. One of the 60-ft. towers was seated on the terrace of a steep rock bank, and after one bent had been assembled and connected complete from sill to apex, it was revolved about 20 deg. about its sill until the apex was about 15 ft. above the ground, by tackles anchored to the vertical cliff above. It was supported in this position by a horizontal beam passed under it and carried on two crib-work piers, one on each side. The upper stories of the remaining three sides of the tower were then connected to the completed side and revolved to the final upright position, where the tower was completed by adding the members of the lower part. This tower was built in 4 days, and the two cableways were erected and the machinery installed in about six weeks.

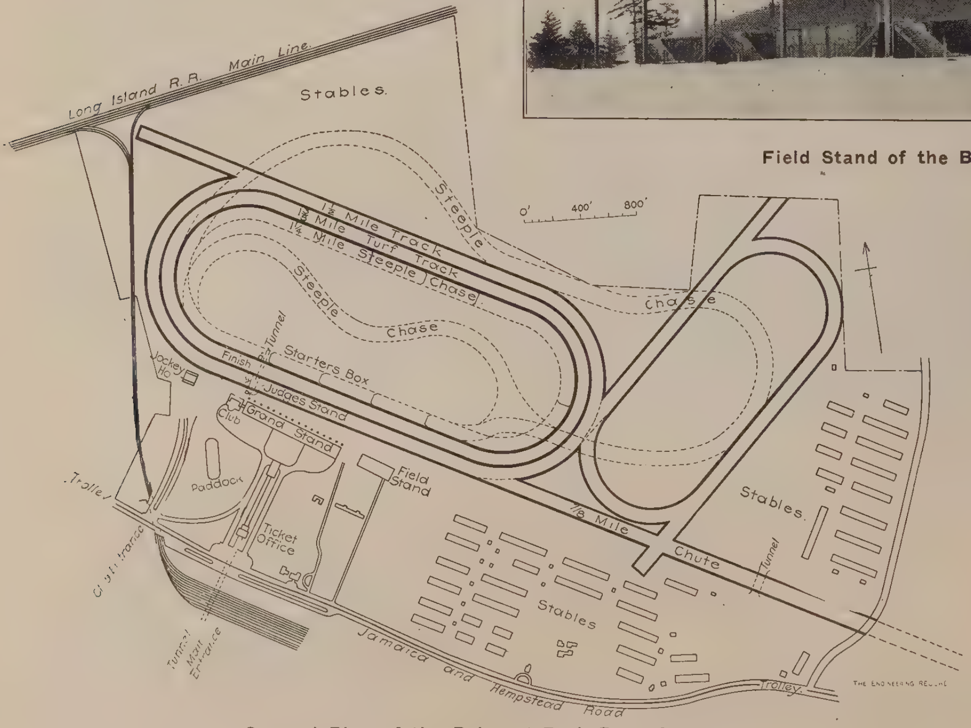
Cableway in San Domingo Canon.

The cableways were designed and erected by Mr. S. A. Cooney, engineer of John A. Roebling's Sons Co.

Engineering Features of Belmont Park.

A new race course is to be opened the coming season within a short distance of New York City, which will probably be the finest and best appointed in this country. It is to be known as Belmont Park, and is owned and controlled by the Westchester Racing Association of New York. The site is about 15 miles from the business portion of New York, on Long Island, at the boundary of the Borough of Queens. The main line of the Long Island R. R., two trolley lines, and a macadam highway pass the park. The latter embraces nearly 600 acres, which are practically level and covered with a light sandy loam, particularly well adapted to the location of a fast track and the development of the surrounding landscape. The dwellings and buildings of an old estate in one corner of the grounds are surrounded by a large wood lot, an attractive feature which has been carefully preserved and developed. The adjacent land was well set out with trees and shrubbery, and the whole estate, as the home of a wealthy family, had received much attention.

The old buildings and wood surrounding them lie near the southwestern corner of the track. It was desirable to include the woods, at least, in the grounds of the stands and club house, and at the same time have these buildings face the north, in order to avoid having the sun shine in the face of the crowd. To use the available space and to fulfill the requirement as to the direction of the sunlight, it was decided to construct a right-hand track, that is, one on which all turns are made to the right instead of to the left, as is the usual rule in this country. The building of this style of track also permitted a more advantageous location of the exercising, steeplechase and straightaway tracks, as well as the stables and buildings connected with them.



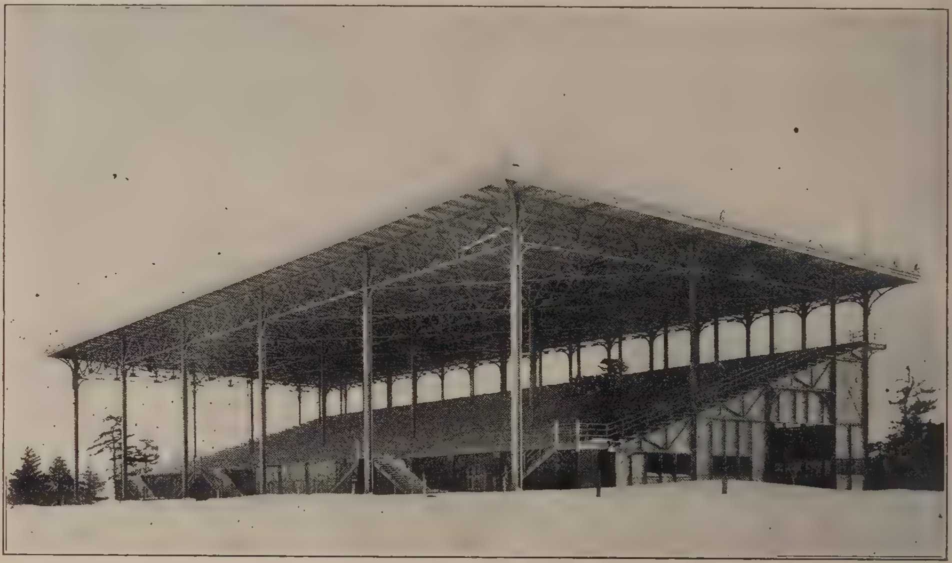
General Plan of the Belmont Park Race Course.

The main track is 1½ miles in length, with a width of 100 ft. on the stretches, which narrows to 75 ft. at the middle of the turns. It is of standard shape, that is, the length of each turn and each stretch is exactly one-quarter of the full length of the track. The turns are built with their surfaces inclined slightly toward the inner rail on a curve approaching a parabola with the more abrupt portion nearest the rail. This slope is provided to assist in overcoming the inclination of the bodies of the horses required to hold them to the turn in negotiating it at a fast pace, and also to provide for the surface drainage. The stretches are crowned near the center, from which they slope to both sides. The sloping of the turns and the crowning of the stretches are gradually graded into each other at their junction, so as to make the change imperceptible.

At the majority of courses the exercising is done on the regular track and must be finished and the track cleared by 10 o'clock in the morning, in order that the surface may receive the required attention before the afternoon races. A mile track, of the same width and construction as the main track, is provided in this park for exercising, and will be available at practically all times.

The home stretch of the main track is continued east from the turn to make a ⅞-mile straightaway, 125 ft. wide, which ends at the regular finish, and throughout its length is in full view of the people in the stands. The back stretch is 150 ft. wide and is also extended from the west turn to give a length of 1¼ miles from its end to the regular finish, with but one turn. The exercising track is built tangent to the main track on the east end in such a manner that a straightaway stretch leads from the turn on it to the one on the larger track. The back stretch of the exercising track is extended to provide a length of 1⅜ miles from its end around the north turn, and then on the main track to the finish. This extension was made specially for the Belmont Cup races.

Within the main track is a turf track 100 ft. wide and 1⅜ miles long, on which special races will be run. Inside the turf track is a steeplechase 1¼ miles in length, and also 100 ft. wide. An outer steeplechase, which crosses the main track twice and is several miles long, is laid out in conjunction with the inner one, with its finish at the regular place.



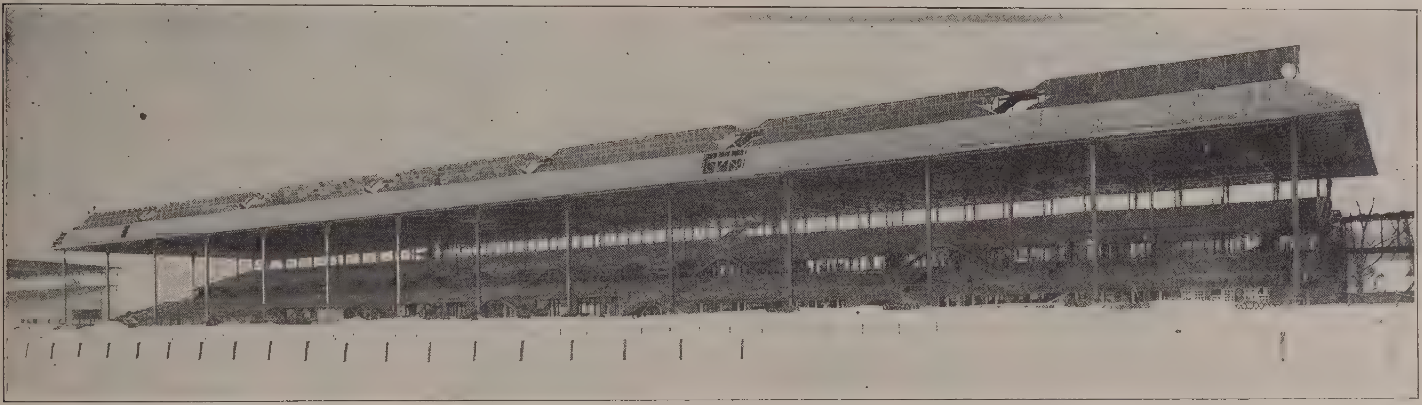
Field Stand of the Belmont Park Race Course.

The grading and construction of the tracks were comparatively simple work. The top soil was excavated to a depth of about 1 ft., and the subgrade made to conform to the shape of the finished grade and then rolled. The subgrade was next backfilled to a depth of about 8 in. with loose soil, and the remaining depth thoroughly rolled after being placed. No underdrains were laid, as the soil is quite porous and surface water drains away rapidly. Catch basins are provided at frequent intervals near the inner rail on the turns and along both rails on the stretches, which are connected with the main drainage system.

The location of the finish and the buildings at the southwest corner of the park made them easy of access from the highway, and also permitted building the railroad and trolley terminals entirely outside the grounds. A four-track connection with the main line of the Long Island R. R., which lies along the north side of the grounds, is built parallel to the west end of the park to a double-track tunnel under the southwest corner of the grounds and under the turnpike. Beyond this tunnel the tracks turn to the east and enter the terminal yard, which is just beyond and parallel to the highway.

The terminal has ten tracks, each 800 ft. long, eight of them in pairs, with a single track on both sides of the four pairs. The tracks in the pairs are on 12-ft. centers, and the adjacent tracks in the adjoining pairs and the outside single tracks are on 30-ft. centers. Between each pair is a concrete platform, 19 ft. 7 in. wide, and the length of the tracks, covered by a galvanized-iron umbrella roof. These platforms are 3 ft. 7 in. above the top of the rails, and are all connected opposite the main entrance by 10-ft. concrete stairways to a tunnel which leads under the tracks and the turnpike to the grounds on the other side. The tunnel is 530 ft. long, has a minimum clear height of 7½ ft. under the tracks and a minimum width of 20 ft. It is built entirely of concrete, with I-beams imbedded in the roof. The head room under the tracks was so limited that the I-beams were reinforced with angles and plates to secure sufficient section in the available space. The roof directly under the tracks is a slab of concrete 1 ft. 9 in. thick, with transverse reinforcement rods near its top and bottom. Between the tracks the roof is arched with a minimum thickness of 6 in. at the crown of the 10-ft. spans between the transverse beams. The remainder of the tunnel roof under the highway is made up of 20-in. 65-lb. I-beams on 3½-ft. centers, transversely, with 9 in. of rise in the arches between them. The 6-in. concrete floor is finished with a cement mortar facing.

The electric trolley tracks along Hempstead Turnpike are also connected with the tunnel, and the passengers from them will reach the grounds through it. The highway was originally 50 ft. wide, but it has been widened to provide for two 40-ft. roadways and a parking laid out down the center between the roadways for a length of 2,000 ft. in front of the grounds. It is planned to place three tracks of the electric line outside of the road next to the railroad terminal and leave the drives for the exclusive uses of vehicles. The tracks are to be placed on 20-ft. centers, with concrete platforms between them, which will be connected to the tunnel by two concrete stairways. These stairways will enter the tunnel near the southern edge of the highway and end on a shelf 7 ft. wide, which is slightly elevated above the main floor of the tunnel and separated from it by a high woven wire fence stretched between iron posts embedded in the concrete. This shelf is connected at its southern end to the main floor of the tunnel by a flight of steps, and will ordinarily be separated from it by an iron gate. In case the main floor should prove inadequate to accommodate the railroad passengers during an unusual crowd, this gate can be opened and the trolley entrance thrown into service.



Grand Stand of the Belmont Park Race Course during Construction, with the Field Stand at the Left.

The tunnel floor is level under the railroad tracks nearly to the edge of the highway, where it rises on a 10 per cent. grade for a little over 100 ft., and then continues practically level to the north side of the highway, at which point another 10 per cent. slope, 100 ft. long, leads from the tunnel and connects with a 30-ft. concrete walk. This walk, 450 ft. long, is covered by a roof and leads directly to the grandstand.

The tunnel will be used in the warmer seasons of the year and will be quite crowded at times, particularly when the people are leaving after the races, so adequate ventilation had to be provided. The slope of the floor at the south end is not followed in the roof, but the change in grade is made in one step. The riser of this step is left open and a space 5 ft. high and the width of the tunnel is provided, with its top at the lower edge of the roof, which will insure a good circulation, as the local prevailing summer winds are from the south. A 4-ft. 8-in. shaft, the width of the tunnel, opens into the parking line in the highway, and ventilator openings are inserted toward the north end, which are connected by longitudinal ducts in the roof to outlets in the grounds.

Rear View of the Club House.

The position of the clubhouse, grandstand, and field stand are relatively the same in this as in other grounds, but reversed to fit the right-hand tracks. The west end of the grandstand is directly opposite the finish and 30 ft. from the club house. The field stand is about 150 ft. east of the grandstand. The buildings are placed at a slight angle with the tracks to insure an unobstructed view of the course from every seating position within them. The required angle was determined by first plotting the tracks as they were to be laid out and the approximate location of the buildings near the finish. Lines of sight were then drawn from all points in the seating space of the stands and club house to the inner and outer rails of the main track at the finish, to the rail in front of each point, and to the rear stretch. The buildings were then shifted until none of these lines of sight crossed or were interfered with by parts of the adjoining buildings. The field stand had to be placed a few feet in front of the line of the grandstand, and its floor raised slightly above the floor in that building to fulfill this condition.

Observations were then made on the inclination of the sun's rays at different hours in the afternoon on different days throughout the regular racing season. The results were plotted on a sketch map containing the projected location of the buildings to be certain before commencing construction that the sun would never shine in the faces of the crowd when its attention is directed to any part of the tracks.

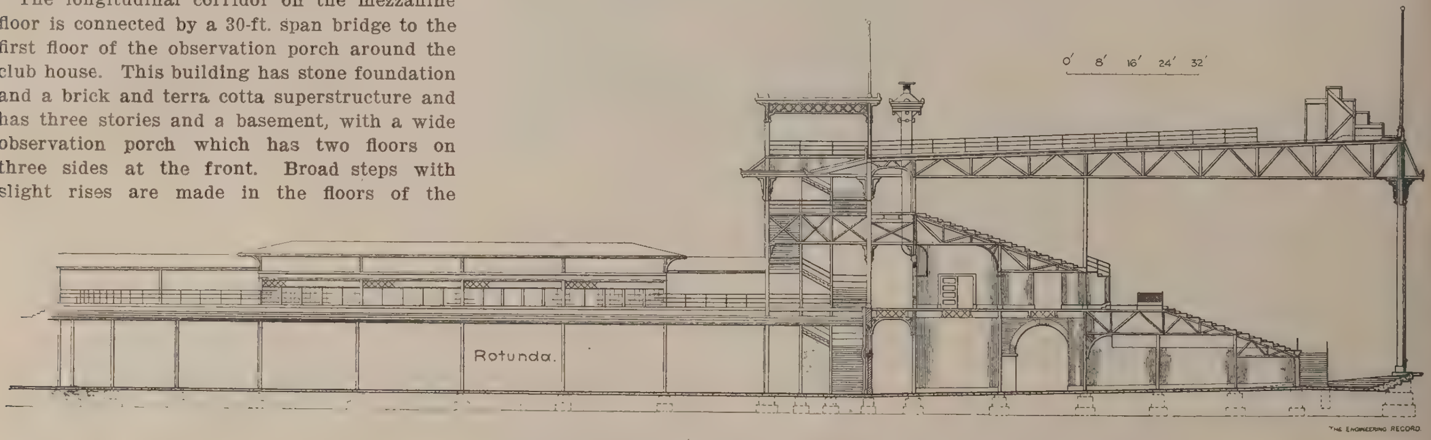
The grandstand is the largest and most important building in the park, and embodies features of design which make its arrangement a departure from that usual in such structures. It is 650x116 ft. in plan, with a somewhat semicircular, one-story rotunda, 250 ft. wide and 200 ft. deep, in connection with it in the middle at the rear. The seats are all in one stage, but are separated at the center by a mezzanine platform into an upper and lower tier. The concrete sidewalk from the railroad terminal leads to the center of the rear side of the rotunda, where a broad flight of stairs ascends to the roof of that building. At the top of these stairs a 16-ft. walk turns to the right and one to the left from the main walk, and, following around close to the edge of the rotunda roof, enter the grandstand at the rear through entrances on either side of a main entrance. A 16-ft. walk is continued across the center of the rotunda roof from the top of the stairs to the main entrance of the grandstand near its center at the rear.

Short transverse hallways connect the three entrances with a longitudinal corridor, 8 ft. wide in the clear, which extends the length of the building. This corridor is on a mezzanine floor on the same level as the platform between the upper and lower tiers of seats. Stairways lead down from the platform to the seats below and up from it to the seats above. The mezzanine corridor and the side entrances at the rear are connected by stairways to a corridor which runs the length of the building at the rear of the upper tier of seats. Stairways lead down from this rear corridor to these seats. Five rows of bleachers have been arranged on the roof near its front edge and are reached by two stairway towers at the rear of the stand. These seats were added after the general plan of the stand had been made, and in order not to change the arrangement of the remainder of the seats, stairway towers were placed at the rear as the most feasible manner of reaching the bleachers.

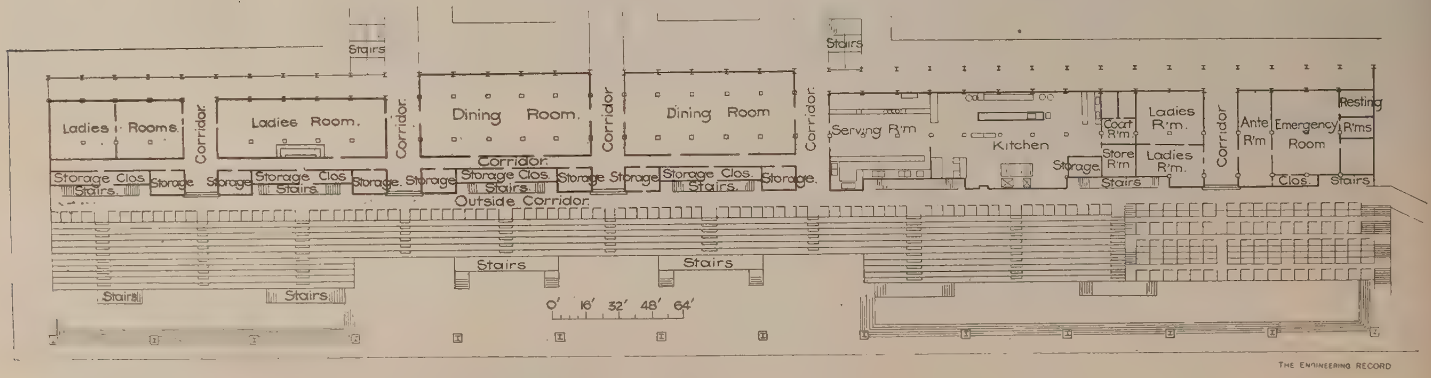
The main part of the stand will be provided with movable settees. The rear row of the lower tier of seats is divided in boxes, which will be provided with chairs, and will be for the use of the public. The west 100 ft. of the whole lower tier is also divided in boxes, but these will be for the exclusive use of the club members and their guests. The stand has a comfortable seating capacity of over 11,000.

The introduction of the mezzanine corridor and platform permitted placing the seats all in one stage (except the bleachers), and by landing the people in the center of the building, avoided a procession through the rotunda and the rooms below, as well as insured rapidity of ingress and egress. It also gives an opportunity for locating the dining rooms, wine rooms, etc., on the second floor instead of on the ground floor, as is the usual plan. The lower floor contains lunch counters, bar, commodious police headquarters and extensive toilet arrangements. The floor of the rotunda is of concrete, with its surface sloped toward catch basins located at different points, and it can be flushed with water from hose connections at several points around the walls. The floor of the lower part of the stand is also of concrete and extends under the front and side walls of the building into broad sidewalks. The sidewalk along the front is connected with the seating floor by several stairways. Its surface is inclined toward the stand in order to avoid its use as a vantage point from which to view the races, with consequent discomfort to those desiring to move longitudinally along the walk.

The longitudinal corridor on the mezzanine floor is connected by a 30-ft. span bridge to the first floor of the observation porch around the club house. This building has stone foundation and a brick and terra cotta superstructure and has three stories and a basement, with a wide observation porch which has two floors on three sides at the front. Broad steps with slight rises are made in the floors of the porches, which are supported along the outer edge by cast-iron columns, 31 ft. long and 21 in. in diameter. The interior of the building is devoted to accommodations for the club members.



Transverse Section through Grand-Stand and Rotunda of the Belmont Park Race Course.



Plan of the Mezzanine Floor and Lower Tier of Seats in the Grand Stand.

The field stand, 95x250 ft. in plan, has a structural steel frame with a front wall of brick. The ends and the rear wall are of sheeting on the steel frame and the rear wall is fitted with hammered glass in sashes and frames. The seats are placed in an uninterrupted range and are entered from stairways leading up from the front. The space beneath the seats has a concrete floor and contains accommodations similar to those provided on the first floor of the grandstand.

The track officials and jockeys will be accommodated in a two-story frame building, 81½x58 ft. in plan, just west of the club house. This building has been designed with special regard to the convenience and comfort of the secretary and his assistants, the stewards and the riders, and has its second floor connected with the roof of a broad observation porch from which the jockeys will be afforded an unobstructed view of the tracks.

The saddling paddock is 55x216 ft. in plan and has a slate roof supported on yellow pine truss frames with a span of 55 ft. between the single rows of posts on either side. A row of 18 box stalls is placed down either side of the center and the posts of the frame form part of the sides of the stalls. The half-circular ends of the roof are supported by half trusses, which are carried by a specially designed bracket that transmits the load to the posts in the side rows and avoids placing a post in the open space between the stalls.

The stables are built in single rows of 10x14-ft. box stalls, with the roof extended 14 ft. on both sides and the ends to provide an exercising space in bad weather. They are built in units of from 10 to 30 stalls and will provide quarters for about 1,000 horses. The stable boys accompanying the horses will be quartered in rooms built over the stalls. Seventeen private kitchens are built for the use of owners having large strings of horses, and three combined kitchens for the general use of owners who have only a few animals. The stables and kitchens are placed at the east end of the grounds and are separated from the buildings at the finish by a grove of trees.

A transverse tunnel is built under the east half of the ⅞-mile straightaway track to connect two groups of stables, and a tunnel under the tracks at the finish connects the infield with the club house and stands. These tunnels avoid the danger of crossing the tracks and the damage to the track surface by the usual passing across it at the finish line.

Carriage drives are built on either side of the entrance from the railroad terminal and a drive with two roadways leads to two broad spaces, one on either side of the jockey house. A space to the west is reserved for automobiles and one to the east for coaches. The club entrance also connects with that on the west of the pedestrian entrance which leads to a broad plaza in the rear of the club house and stand. The entrance at the east leads to a similar space at the other side of the rear of the stand and to carriage stables and cab stands. All driveways are arranged to avoid crossing pedestrian entrances and the different parts of the course are separated by specially designed manproof wire fences.

A sewage disposal plant consisting of a septic tank and two intermittent sand filters is built in connection with the grounds, about ½ mile from the stands. The sewage flows through a 5x5-ft. screen chamber into the septic tank, which is 10x20 ft. in plan and has a flow line 4 ft. above the bottom. The tank effluent is drawn off by an 8-in. cast-iron pipe with its lower end about 2 ft. above the bottom of the tank. The discharge of this pipe is into a 10x15-ft. dosing tank which contains two automatic Miller siphons that divert the flow alternately on the two 15x30-ft. sand filters.

The plans of the course and buildings were made by Mr. Chas. W. Leavitt, Jr., of New York, who also supervised the execution of the work.

A GLASS-ENCLOSED HYDRAULIC EQUIPMENT including two wheels of standard make is to be provided for the testing plant of the new works of the Lombard Governor Co., which began moving two months ago into a group of stone buildings on the Sudbury River, at Ashland, Mass. The wheels, of the vertical type, will operate in an open forebay with plate glass sides and end, and special couplings are arranged so that power for the works may be taken from a steam-engine plant or from the water wheels. It is intended that any desired load may be thrown upon the water wheels, in order to test governors connected with them, and while the forebay will be well inside one of the buildings, so that the entire mechanism may be kept under observation regardless of the weather, it is intended to provide for having electric lights under the water when necessary.

The Beaver Movable Dam.

By W. H. Chadbourn, Jr., M. Am. Soc. C. E.,
Assistant U. S. Engineer.

The movable dam in the Ohio River, near Beaver, Pa., is variously called the Beaver Dam, or Merrill Dam (after the late Col. Wm. E. Merrill, Corps of Engineers, U. S. A.); but officially is known as Dam. No. 6, Ohio River, since it is the sixth in the series for the canalization of the Ohio River, commencing at Pittsburg, Pa. It is about 31 miles from Pittsburg, Pa., and 3 miles from Beaver, Pa.

This dam with lock was opened for navigation in August, 1904, though not entirely completed yet serving its purposes, so far as navigation is concerned. The first appropriation for this work was made by the general government on Sept. 19, 1890. Actual work of construction was begun June 26, 1892, from which it would appear that the work occupied 12 years; but much of this time was lost by lack of funds, failing contractors, changes of methods due to new laws, as well as the usual loss of time due to floods, ice, etc.

The lock is located on the right bank of the river. It has a clear length between gates of 600 ft. and a width of 110 ft. These dimensions were necessary by reason of the principal traffic to be accommodated—coal in flat bottom barges of great length and width, moving in fleets. The gates are of the rolling type, differing in this respect from the familiar swing lock gate. This type of gate necessitates deep recesses, or slips, behind the land wall of the lock, somewhat in excess of the width of lock. The total length of the river lock wall is 693 ft. This wall is 11 ft. thick above the lock floor and 14 ft. thick below the floor, and has a height of 18.2 ft. above and 16.5 ft. below the gate sill, making a total height of 34.7 ft. The land wall is 595 ft. long; is 5 ft. wide on top, 10 ft. wide at the base and is 32 ft. high. The upper guiding wall is 767.1 ft. long and the lower guiding wall 650.7 ft. The lock walls are of ashlar masonry with a concrete core or backing, and with a 30-in. stone coping. These are excellent specimens of masonry. The stone is Beaver Valley sandstone, which wears exceedingly well. The guiding walls are entirely of concrete, faced with oak timber 8 in. thick.

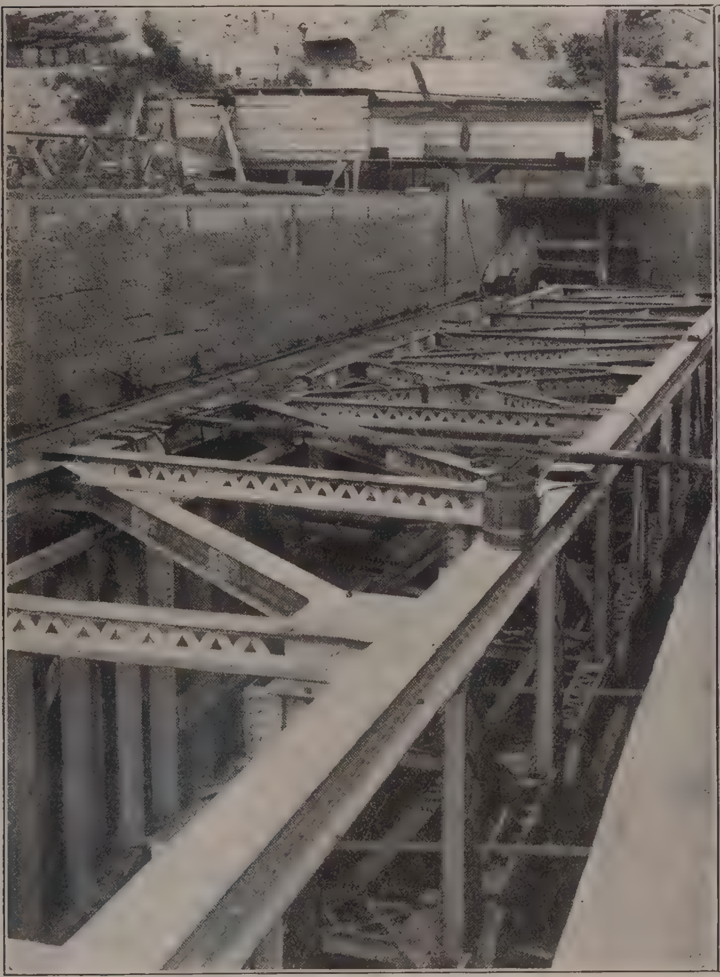
The movable dam begins at the river lock wall at about the center of the lock. The dam is 1,000 ft. long, 760 ft. of which is non-automatic and 240 ft. is automatic. The first 600 ft. from the lock is composed of Chanoine wickets. It is the part of the dam over which navigation passes when the dam is down, and is called the navigable pass. The sill is as low as the river bed above and below the dam, therefore offers no obstruction either to vessels or to the flow of water. The wickets when down lie below or down stream from the sill, therefore are protected by it.

A pier 12 ft. in width separates the navigable pass from bear-trap weir No. 1, which bear-trap is 120 ft. in length. Bear-trap weir No. 2 is exactly similar to No. 1, from which it is separated by a pier 14 ft. in width. Weir No. 3 is of the same length as the other weirs (120 ft.). It is separated from No. 2 by a pier 14 ft. in width and is closed by trestles of the A-frame type, known as the Thomas A-frame dam.

The floor of the dam, or top of the fixed part, is composed principally of 12x12 in. oak timbers, securely framed and bolted together, the whole being built into the concrete masonry foundation. The concrete extends 14 ft. below this timber top on the upstream edge, is 3 ft. 6 in. thick in the central portion of a cross-section, and is 12 ft. deep in the lower portion. It is 29 ft. wide transversely. At the upstream face, sheet piling is driven wherever and to such depth as it was possible to drive it, say, from 6 to 12 ft. below the bottom of the concrete.

The movable dam proper is secured to the foundation thus prepared. A unit of a Chanoine movable dam consists of these essential parts; a wicket, which is a rectangular wooden panel, capable of being balanced by counterweights on a horizontal axis, a horse, and a prop. The horizontal axis is placed at from 42/100 to 47/100 of the height of the wicket from the top of sill, being 9/100 to 14/100 of its length above the third point, thus giving a considerable preponderance against overturning. The portion of the wicket above the axis of rotation is called the chase; that below is designated the breech. When raised, the breech rests against the sill of the floor. The axis of rotation of the wicket is formed by the head of an iron horse, or trestle frame, which itself revolves around a horizontal axis fixed to the floor or sill. The prop, as its name suggests, supports the wicket, when up; the prop, horse and wicket all being secured to the horizontal axis or cross-head in the head of the horse.

When raised, a wicket is supported by the horse, which stands nearly vertical, and the prop which is inclined downstream. The wicket is inclined downstream at an angle of 20 deg.



Lock Gate in Its Recess.

Underside of Bear Trap Dam.

When the foot of the prop is tripped and it moves down the slide, the horse turns round its axis and falls to the floor as a continuation of the prop. The wicket falls on top of the horse and prop, and protects them from the action of the current and from floating bodies. The foot of the wrought iron prop, above mentioned, rests against a cast iron hurter fixed to the floor. This hurter consists of a lug or stop against which the prop rests, a channel around the lug and a long tail with sloping sides. When the wicket is raised the prop slides up the central grove, runs up an inclined plane and drops into its seat against the stop. When the wicket is lowered the prop is pulled upstream away from its seat, which is elevated, drops down into the channel leading around same, and as the wicket is released, slips around the seat and back into the central groove again by the time the wicket is down.

Thus the dam is formed by a series of wickets extending across the nagivable pass, each unit being entirely independent of its neighbor. Each wicket is 3 ft. 9 in. wide, with a space of 3 in. between them, which is to prevent the wickets fouling one another during maneuvers. These spaces are utilized to pass the natural flow of the river, and as this grows less they are closed by needles or joint covers as needed to maintain the pool at its full height.

The navigable pass is maneuvered by means of a derrick or service boat, 56 ft. in length by 18 ft. in width. This boat is provided with 15-in. wide fenders, to keep it off the wickets some distance, and with spuds to transmit the reaction to a position on the standing wickets at or below a point opposite the prop. A modern double-drum hoisting engine is mounted near the center, for the principal purpose of raising and lowering the wickets, and for operating the derrick in case of repairs, etc. The first few wickets are raised with the service boat lying alongside and made fast to the lock wall. After this, the boat lies alongside the standing wickets, and the operation is as follows: The dam-tender seizes the handle of the wicket with a boat hook. This is an iron rod about 5 ft. long and 1 in. in diameter, fastened to a wooden handle about 8 ft. long and terminated by a hook, 2 ft. above which there is a ring. A wire rope about 50 ft. long is tied in this ring and is wound at the other end around the drum of the engine, and passes through a sheave on an outrigger at the bow of the boat. When this rope is drawn in, the wicket, horse and prop rise gradually, and the prop is finally seated against its seat on the hurter. When this occurs the rope is released and the breach of the wicket is carried by the current against the sill, the wicket assuming its proper position of 20 deg. with the vertical. This operation is repeated until the 150 wickets composing the pass are all raised. A slight head begins to manifest itself when about one-half the wickets are up, but does not get to be of any consequence, until the last 20 or 30 wickets are being raised, and is easily managed even then, the only difficulty being in hooking the handle on the wicket lying on the bottom. The needles or joint covers are put on as needed to maintain the pool.

In lowering the dam it is only necessary to catch a wicket at the top, in a handle provided, and draw it upstream until the prop drops off the inclined step on the hurter; the wicket is then released and the pressure of water against it forces the prop into the downward channel of the hurter, when the wicket falls gently into position on the permanent foundation, behind the sill, the water acting as a cushion or buffer. The operation of lowering is commenced at the end of the navigable pass farthest from the lock. A 5-in. hawser runs from the lock wall to the stern of the service boat around a capstan, which serves to draw the boat toward the lock as the wickets are lowered and to prevent the boat being drawn through the open space in the dam. The pools rapidly equalize, however, especially if the large weirs are lowered first, so that by the time one-third of the wickets are down there is but little head.

The two bear-trap dams are of the original American or old style type. Each span consists of two gates or leaves, an upstream and a downstream one, revolving around horizontal axes fixed to the floor; the upstream leaf overlapping the downstream one when down, and resting on its point or edge when raised. The gates close tightly against each other and against the side walls of the pier which separates the two spans and the piers at other ends. A culvert is built in each pier for each trap, ending in the upper and lower pools. Five passages connect each culvert with the space under the gates, and the culverts are provided with valves in their upper and lower ends for making connection with the pools. The pressure under the gates is increased when water from the upper pool is introduced, and the gates rise when the head is sufficient. When the connection with the upper pool is closed and connection is made with the lower pool, the gates fall, the head being relieved.

The bear-traps at Beaver dam are the longest yet attempted, being each 120 ft. in length. The construction is a combination of wood and steel; the principal members which are subjected to stress being of steel, and the packing or filling between the beams being of oak and pine. The piers are of dressed ashlar sandstone with cement core, similar to the lock walls. The conduits or culverts are 4½ ft. in diameter. The valves are of the butterfly type, operated from the top of the pier through a shaft with a sector engaged in a pinion actuated by a long lever or wrench. The valves can be securely locked in any position. Air is introduced on the under side of the lower leaf, intended to be pocketed between the webs of the girders and girts and thus assist the gates to rise by the displacement of water on the under side of the gates. From experiments made thus far the air feature is of little value as applied on these gates; probably due to leakage.

The gates require about 4 ft. of head on the pass dam in order to rise, and with this head they rise very slowly until the end of the upper leaf is out of the water. Frequent trials of the gates under 9-ft. head were made the past summer and they would rise in six to eight minutes. It is quite an interesting sight to see such an immense opening made in a dam in three to four minutes, of 1,560 sq. ft. area of cross-section with the water under a head of 10 ft. and closed in about twice that time. A dam provided with two such regulating weirs as this is quite safe from being caught in a rising river, so that the wickets cannot be put down before they are overflowed.

The last weir, of 120 ft. width, is closed with a type of trestle dam. The dam consists of a number of A-shaped trestles set up adjoining each other across the stream. The upstream faces or legs are anchored to the sill, which also protects the trestle when down, and hold back the water. The downstream legs are similarly fastened to a timber. The two legs of each trestle are connected at the top, where they are placed close together, and at the bottom they terminate in eyes which are connected by pins to journal boxes attached to the masonry. The upstream member of each trestle is a frame of channels suitably arranged and covered with plates riveted on. The edges of these plates do not quite touch each other, a slight crack of one-eighth inch being left to avoid fouling when operating, and the small amount of leakage serving to flush out the bed between the legs or members. The downstream post is similar to the other one. At the bottom of each post a piece with an eye, bent so as to have the part containing the eye stand vertical, is riveted to the frame, and these are connected by pins to journal boxes on the floor. These boxes have their eyes centered at a greater distance from the floor than one-half the width of the trestle face, so that the trestle may turn without binding.

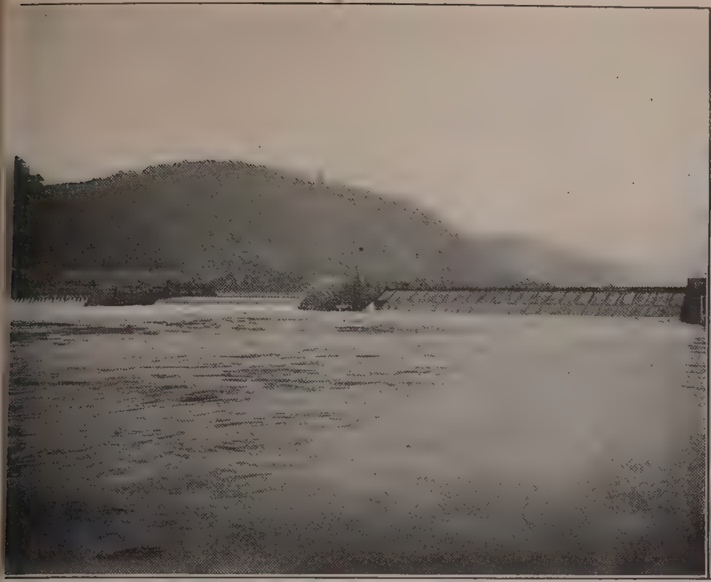
In the head of each trestle is located a sprocket wheel for use in connection with the maneuvering chain. This wheel turns on a shaft attached to the frames. At one edge of the wheel and forming a part of it is a ratchet. A pawl, having a tooth which fits loosely into this ratchet at one end, and the opposite end formed into a flat tail, is pivoted so as to be readily lifted out of the ratchet by moving the flat end. This movement takes place just as the trestles become vertical in raising, by the flat end being drawn against a stop or projection on the adjacent trestle. As long as the trestles remain touching each other this stop holds the tooth of the pawl out of the ratchet, and the wheel is free to turn. As soon as the trestle separates slightly from its neighbor, the pawl, being released from the stop, immediately falls into the ratchet and arrests the movement of the wheel. The pockets in the wheel are made to fit the chain used for raising and lowering the trestles, and this chain cannot move without also moving the trestle when the pawl is in the ratchet.

A winch is located on the third pier, to which the maneuvering chain leads. To raise the trestles the chain on the winch is wound in, bringing up the first trestle and starting two others. A continual winding of the chain brings up the trestles one after the other, the chain being released from its grip on each trestle as it assumes its proper position as previously described. To lower the dam the operation is reversed, the chain slacked out and the trestles fall one by one. This section of this style of dam is the only one in existence known to the writer, and for this reason has been described somewhat in detail. The dam has not had sufficient trial as yet to demonstrate how it will act under various conditions or what unprovided-for difficulties may arise.

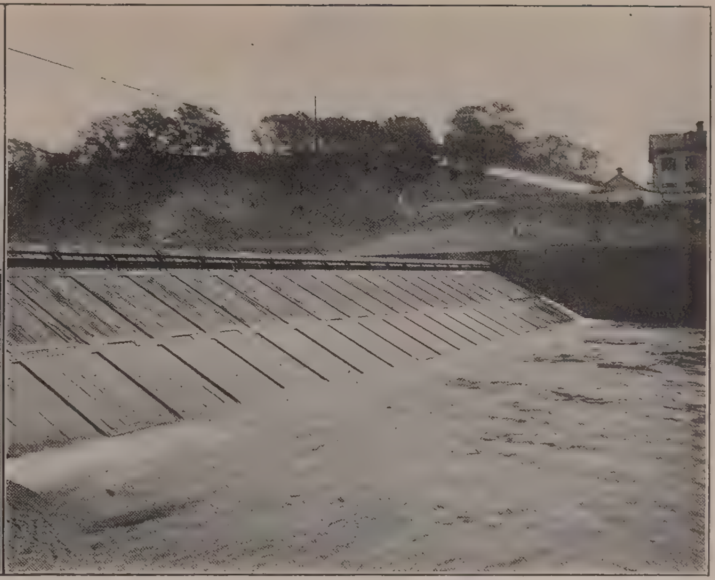
The power house is a handsome brick and stone-trimmed structure with a tower which contains a water tank. A Heine water-tube boiler furnishes the power to operate the lock. An air compressor furnishes the air to assist in operating the bear-trap weirs, to operate the 32 filling and emptying valves in the river wall, and for an air lift to elevate water to the tank. At present the gate engines are operated by steam transmitted from the power house; but as there is much trouble from condensed steam, the air compressor plant will be increased and the gate engines operated with compressed air. In the power house there is also a small machine shop, a blacksmith shop, and a small office for the lockmaster.

Two 8-room modern brick dwellings, stone trimmed, are located near the power house, above and below or upstream and downstream therefrom, for the use of the lockmaster and employees.

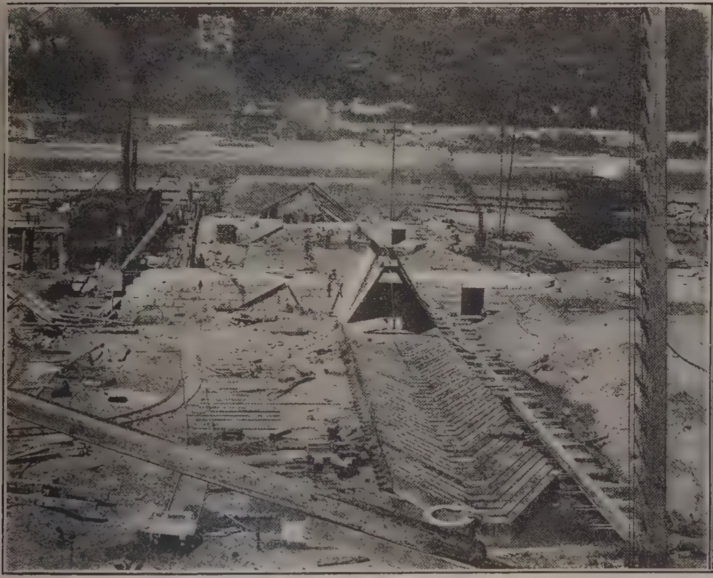
The lock and dam were constructed within three separate cofferdams. First, the lock site was surrounded by a cofferdam 1,530 ft. in length. This cofferdam was built in September, October and November, 1892. The lock was practically completed in June, 1897. In April, 1897, a contract was made for 600 ft. of Chanoine dam and pier No. 1, and work commenced



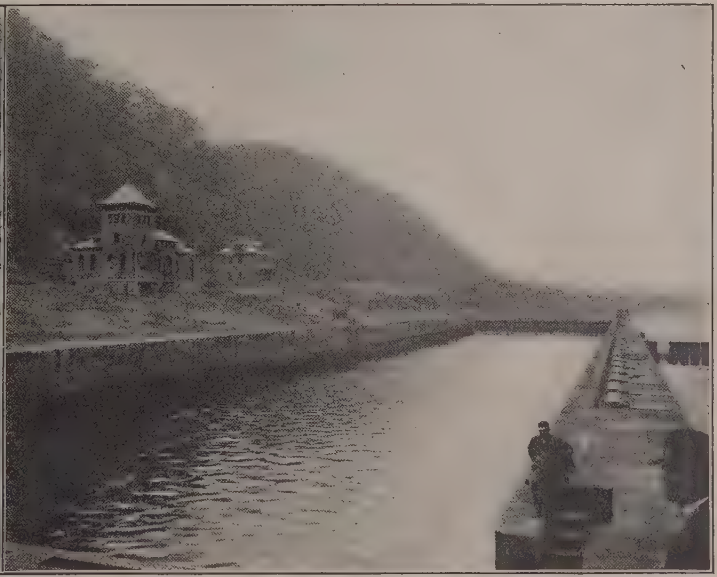
Bear Trap and Chanoine Dams.



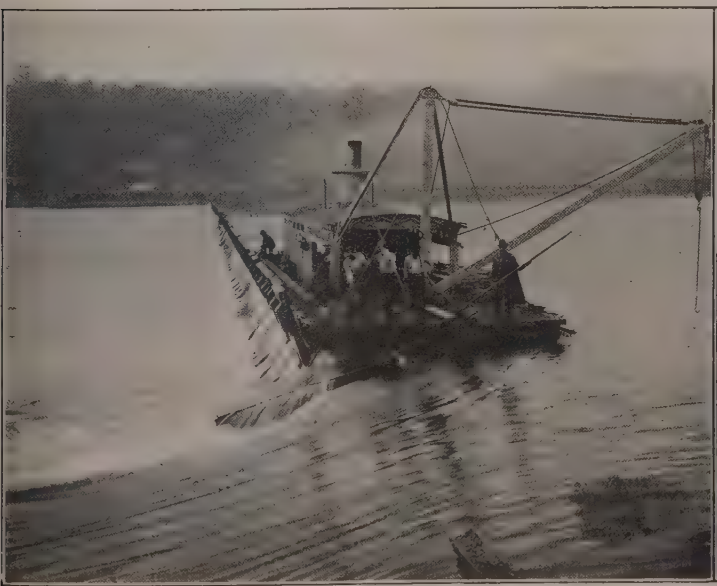
Lower Leaf of Bear-Trap Dam.



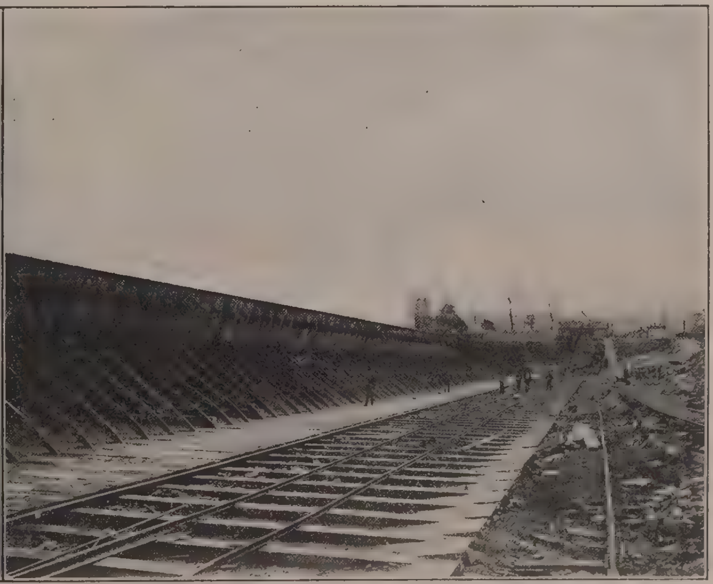
Thomas A-Frame Dam.



Lock No. 6, Ohio River.



Maneuvering Boat Opening a Chanoine Dam.



View of Chanoine Dam from Below, in Coffer.

in June. A cofferdam enclosing about 500 ft. of the dam was built, this coffer being about 1,400 ft. in length. The government took charge of the work under this contract in November, 1897, and completed 432 ft. of the Chanoine dam of the navigable pass by June, 1899, and this portion of the river was opened to navigation. In 1899 a contract for the remaining portion of the pass, the piers, weirs and abutment was let, and the contract was completed in October, 1901. In June, 1902, more funds having become available, shortly afterwards contracts were let for the remaining work, lock gates, machinery, buildings, etc.

The work to date has cost $1,041,000.

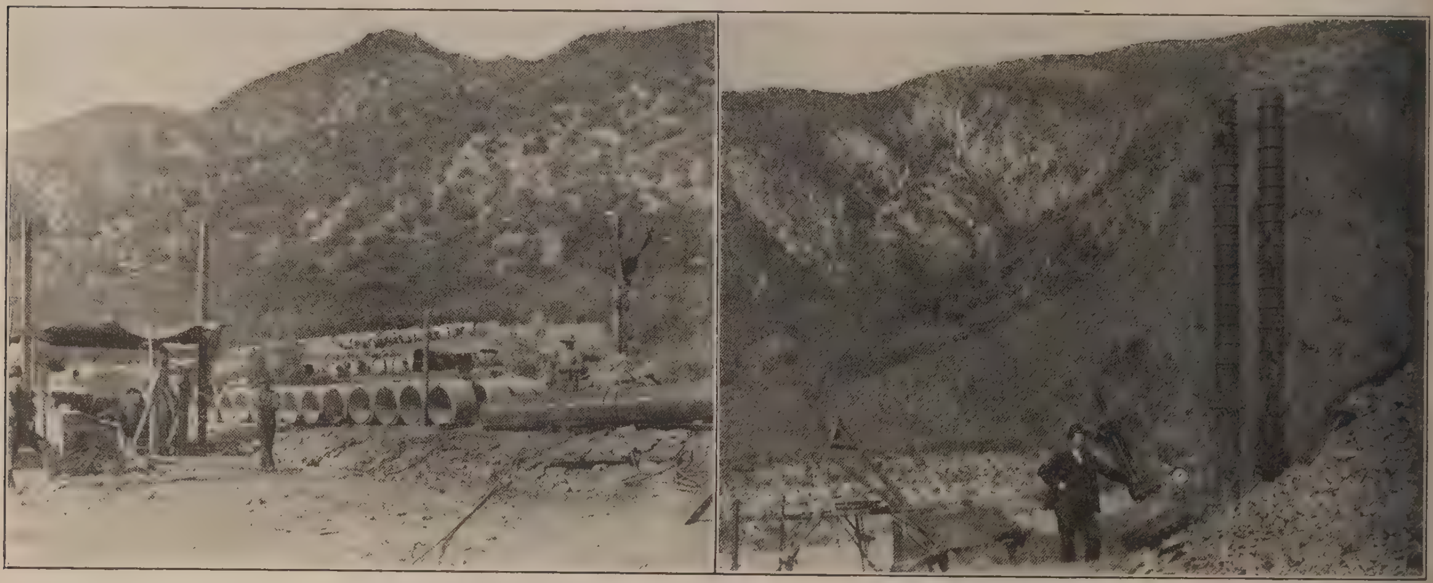
An Electric Speed Indicator.

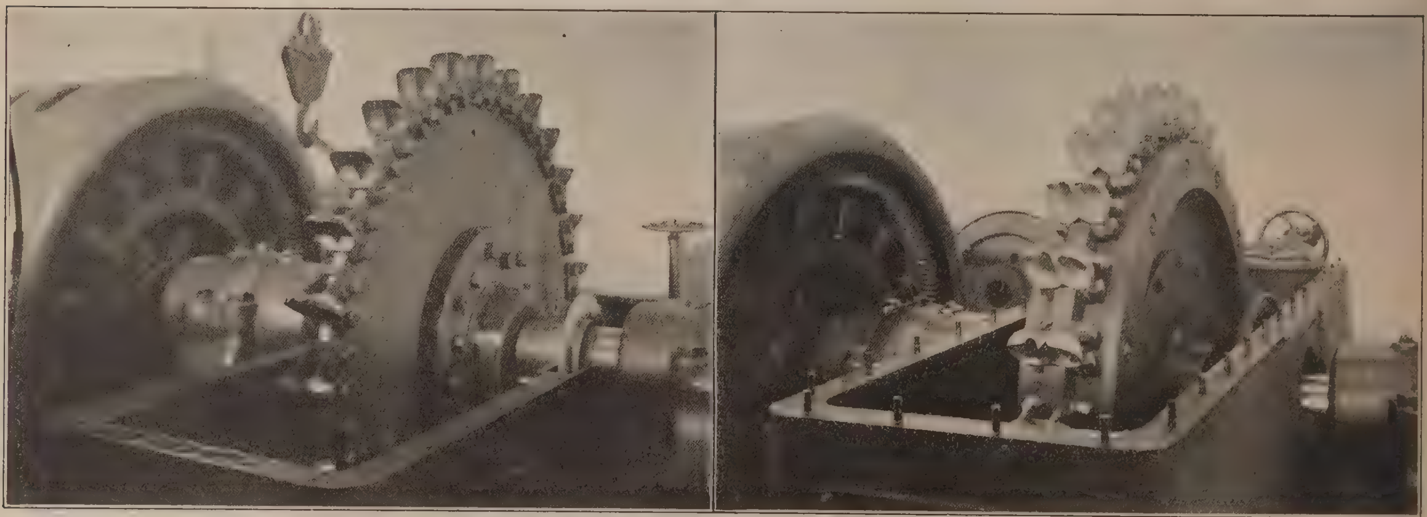
An electric speed indicator has recently been described in the German technical press. It is based on the fact that an intermittent voltage applied to a choking coil or a transformer sends a current through it, depending on the frequency. The intermittency is produced by a commutating device connected directly or through gearing to the shaft the speed of which is to be measured. An ammeter is connected in the circuit, or, in the case of a transformer, to the secondary winding, and its scale is marked off to read speeds.

The Power Plants of the Edison Electric Company of Los Angeles.—II.

Mill Creek Power Plant No. 3.—Mill Creek No. 3 plant was completed and put into operation during March, 1903. The intake of the plant is located about five miles further up the stream than the intake of Power Plant No. 2. The intake is quite similar to that of the No. 2 plant, consisting of a tunnel through the bed rock of the channel, a shaft for delivering the surface flow into this tunnel, an underground drainage tunnel for diverting the underflow, a masonry dam across the channel for diverting the water into the shaft, and screens at the entrance of the shaft, constructed of T-rails and strap iron. Between the intake tunnel, which is known as Tunnel No. 1, and the sandbox is a short section of redwood flume.

This sandbox is a concrete masonry structure, 100x50 ft., with eight separate chambers from which sediment can be sluiced out without disturbing the flow of water into the pipe line. The slope of each of these chambers toward the sluice gate is 4 ft. in 50. The walls separating the chambers are all lower than the surface of the water in the sandbox, with the exception of the main dividing wall through the center, which reaches to the elevation of the outside walls. This main wall is, of course, designed so that the sandbox can be operated in sections when part is sluiced out.


Mill Creek Plant 3: Cement Pipe Yard; Pipe Line Air Chamber.


The Pelton Water Wheel.

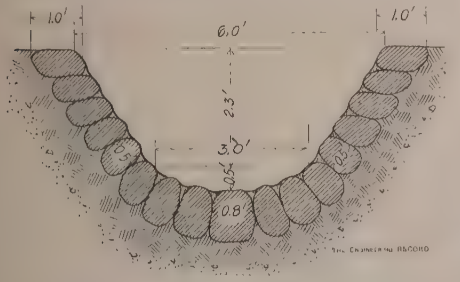
The Doble Water Wheel.

Views of Wheels in Mill Creek No. 3 Plant, Uncovered after One Year's Operation under 1,960 Feet Head.

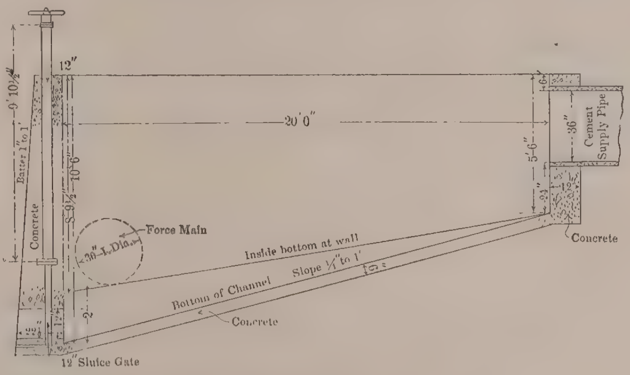
There are five inverted siphons of steel pipe across ravines which cannot be spanned by concrete pipes. These siphons are 30 and 22 in. in diameter and vary in length from 120 ft. to 2,150 ft. They are all designed to carry 20 sec. ft., which capacity is regulated by the grade of the siphons.

There are 25,190 lin. ft. of concrete pipe. The shell is 3 in. in thickness, with 32 in. inside diameter, and consists of wash sand and gravel such as would pass through a screen of 2¼-in. mesh, two parts by measure, to one part of Portland cement by measure. The pipe is manufactured in molds, and it was originally made in 2-ft. sections. These were joined, when laid in the trench, by heavy cement collars on the outside and smooth plaster on the inside of the joint. A tenon and a groove were cast on opposite ends of each pipe section, and this joint was thus made to add to the reliability of the construction. The pipe is laid in trenches and back-filled to a depth of about 3 ft. above the top, except in the tunnels, where a fill is made between the pipe and the sides of the tunnel to a point slightly above the invert on each side. The grade of the pipe is 0.2 ft. per 100 ft., which, it is stated, gives the line a carrying capacity of 20 cu. ft. per second. An accompanying reproduction of a photograph shows one of the cement-pipe yards with a 1,600-ft. hoist used in carrying the pipe to the conduit grade.

There are in all 20 tunnels on the line of Mill Creek No. 3, 19 of these being along the grade line for the concrete pipe, and Tunnel No. 20 being on the force main at a point where the pressure pipe is laid beneath a heavy slide. The length of these tunnels aggregates 7,500 ft. At the end of the gravity conduit is constructed a petty reservoir with a capacity sufficient to give a continuous flow of 10 sec. ft. of water for 6 hours. The purpose of this reservoir is to store water during the hours of the day when the load on the power plant is at a minimum for use on the peak load occurring in the evening. The reservoir is formed by means of an earthen dam 20 ft. long at the bottom and 166 ft. long on top, with a concrete core, and upstream slope paving. All places on the sides and bottom of the reservoir which are not of solid rock are paved in concrete to render the structure impervious to water. The water available by means of this storage will, it is stated, assist the capacity of the plant to the extent of 1,500 h.p. during the peak load.



Rock Canal of Lytle Creek Plant.



Lytle Creek Forebay.

Sand Box and Flume of the Lytle Creek Plant.

The force main from this reservoir to the power station is approximately 8,400 ft. long, and has a fall of 1,960 ft. It consists of 26 to 14-in. pipe. All of the 24-in. and 26-in. pipe is continuous-riveted pipe, varying in thickness from No. 14 to No. 0000 B. W. G., while all of the expanded-joint pipe and the pipe with solid steel flanges, 24 in., is lap welded, varying in thickness from ⅞ to 7/16 in. A portion of the lap-welded pipe at the lower end is wound with 3/16 in. diameter crucible-steel wire to add further to its strength. This wire is fastened at one end to a flange and applied to the pipe under tension in a lathe, after which it is dipped with a heavy coating of asphaltum.

The 18-in. and 14-in. branch pipes are lap-welded pipes of ⅝ and ½-in. steel, respectively. The material from which the No. 3 Mill Creek force main is manufactured is open-hearth, box-annealed steel, varying in tensile strength from 40,000 to 60,000 lb. per square inch. All joints are riveted, excepting those on the 14-in. and 18-in. branches, and on about 600 ft. at the lower end of the force main itself. These exceptions are made with joints of steel flanges, which are welded to sections of the pipe. The branching of the main pipe line into the two 18-in. branches, and the re-subdivision of these in the two 14-in. branches, occurs by means of cast-steel Y's, having radii along their curved sides of from 9 to 12 ft. The force main is well equipped with air valves, air stand-pipe, blow-offs, and five air chambers to prevent water hammer on the line. A pair of these air chambers are illustrated in an accompanying engraving.

A portion of the lap-welded pipe is made with solid welded steel flanges. There is a groove running entirely around the flange into which is squeezed a ⅝-in. circular rubber gasket. This gasket is made in the form of a circle and not of the exact diameter of the groove in the flange. It is inserted into the groove and pressed into the space formed when the flanges are drawn together with their faces metal to metal. The principle of the joint appears to be that water pressure against the rubber gasket tends to press it more firmly into the recess on the flange, and thereby to guarantee against leaks.

The nozzles and tail races for Mill Creek No. 3 plant are below the floor of the power house, the same as stated in regard to No. 2 plant. The power station containing the installations called Mill Creek Nos. 2 and 3 (these being within the same building) is 37½x126 ft., inside measurement. The building is of concrete throughout, with steel truss roof, covered with galvanized corrugated iron. The walls and foundations of the machines of station No. 3 were finished in 19 days after the work was started. The separate tail races from the generators of both these plants unite in a main tail race from which the water passes into the flume leading to Mill Creek No. 1 pipe line, as mentioned. Leading from the petty reservoir at the head of No. 3 force main to connect with the waste flume of No. 2 plant, is a waste flume about 7,500 ft. in length. There is also a spillway over the dam of the petty reservoir, the water from which enters this waste flume directly and is conducted into the No. 2 waste flume, and thence to the head of the No. 1 pipe line.

The station is equipped almost identically with that of Santa Ana No. 1 plant, except for the transformers. One of the four generators is driven by a Pelton water-wheel and the other three by Doble wheels. All the wheels are equipped with the needle deflecting nozzle, and the needle is hand regulated, the deflection being regulated by the governor. Views of both types of wheels are given herewith, taken after one year's operation in each case.

Lytle Creek Power Plant.—The Lytle Creek power plant diverts its water from Lytle Creek, another tributary of the Santa Ana River, located 12 miles northwest of San Bernardino, at a point in the stream known as Millers Narrows. The diversion is made by means of a flume 759.39 ft. in length. The flume is in the nature of a double conduit, one portion being built below the surface of the wash to collect the underflow of the stream, and the other on the surface for collecting the surface flow. Across the stream is a concrete masonry dam by means of which the surface flow can be raised and turned into the upper conduit of the double flume. The dam has two 6x4-ft. 5-in. sluice gates, raised and lowered by hand-actuated gearing.

Below the intake flume is located a concrete sandbox, 30x70 ft. This is of the same pattern as that of Mill Creek No. 3, and includes five separate chambers or sluice ways. Each compartment is 30x14 ft., with the depth varying from 3 ft. 5 in. to 8 ft. 2 in. The sluiceways at the lower ends of the chambers are 24 in. in diameter. The third dividing wall from the upper end is carried up above the water line, the water flowing through a 12x1-ft. weir into the last two chambers. It then passes over a weir 8 ft. long and 2 ft. 2 in. deep into an 8x20-ft. bay, and the gravity conduit leads from this bay through a 48-in. opening. The accompanying engravings include a view of the sandbox and flume taken after the concrete work was completed but before the construction was entirely finished. It will be noted that the flume crosses the chambers at their deep ends, the discharge gates from the flume being clearly indicated.

The gravity conduit consists of 20,162.9 lin. ft. of 36-in. inside diameter concrete pipe, 1,176.66 ft. of open rock canal, and 722.63 ft. of 36-in. inside diameter steel pipe in the form of inverted siphons. The concrete pipe is laid along the sides of the mountains and through all the tunnels. The rock canal lies across level bench land, where pipe construction is not required. It is 6 ft. wide and about 3 ft. deep; as shown in the accompanying cross-section. Between the section of rock canal and the concrete pipe is a small sand trap, for the purpose of receiving any sediment which might wash or blow into the open canal. The inverted siphons are across ravines which have to be crossed under a head or high pressure of water. There are altogether thirteen tunnels on the Lytle Creek plant, aggregating in length 3,092.8 ft. Besides the five siphons in the gravity line from the sandbox to the head of the force main there is a 903.9 ft. siphon to convey water from the tail race of the power house to the irrigating canal of the Fontata Development Co., on the opposite side of Lytle Creek canyon.

At the upper end of the force main is located a concrete forebay, into which the water from the concrete pipe is discharged and allowed to settle before entering the steel pipe. It is shown in an accompanying section and is 10 ft. wide and 20 ft. long inside, with 12-in. walls, the depth varying from 5 ft. 6 in. to 10 ft. 6 in., the slope of the bottom being ¼ to 1. Water leaves at the side through a 30 to 26-in. reducer, 20 ft. long, connecting with the force main.

The force main comprises 1,513.9 lin. ft. of 26-in. internal diameter pipe of thicknesses varying from No. 12 B. W. G. to ½ in. It is all of continuous-riveted open-hearth steel pipe, coated with asphaltum. At the lower end it terminates in cast Y, with four branch pipes; three, each 15 in. inside diameter and 45.35 ft. long, for the three 250-kw. generators in the station, and the fourth pipe, 8-in. in diameter and 38.77 ft. long for the exciters. The waste water from the forebay at the head of the main is conducted by means of a wooden flume to the tail race of the plant, so that the surplus of water carried by the concrete conduit is ultimately delivered to the tailrace at the upper end of the irrigation-supply siphon.

In the Lytle Creek plant, which will have a capacity of 1,000 h.-p., Pelton water wheels are to be used. Two of the generators in this station are the 11,000-volt machines originally installed in Mill Creek No. 2, and the third is an exact duplicate. The output of this station is delivered to the 10,000-volt transmission lines of the company supplying power for railway, pumping and lighting purposes at Riverside, Colton and San Bernardino. The output of the Lytle Creek plant is also connected with the 33,000-volt transmission line to Los Angeles by means of transformers in the Colton substation.

(To be continued.)

A Form of Superheater applied to 30x9-ft. Lancashire boilers was described by Mr. J. Dale, of Warrington, England, in discussing Messrs. Booth and Kershaw's paper on fuel economy in steam power plants, read before the Institution of Electrical Engineers. Instead of covering the top with a non-conducting material, it was utilized as heating surface. On it were fixed horizontal tubes each 30 ft. long and 3 in. in diameter. The hot gases were made to traverse the whole length of the tubes, but as they would ordinarily be leaving the boiler, their temperature did not exceed 750° Fahr. There was a gain of about 125° or 145° of superheat (70° or 80° C.). The result, he said, was uniform and continuous and the system had been found satisfactory.

The Cumberland Extension of the Western Maryland R. R.—II.

A Troublesome Canal Crossing.—The first crossing of the canal and the Potomac River lies about a quarter of a mile beyond the big cut. The work between Sideling Hill Creek and this crossing is some of the heaviest and most difficult to prosecute on the whole line. Several alternative routes were surveyed and their constructive and operating costs estimated in detail in an effort to avoid the more difficult portions of it. One of these alternative lines turned off the present line just above Sideling Hill Creek, crossing the canal, the river, and the Baltimore & Ohio R. R. on a skew bridge 1,300 ft. long. Beyond this bridge the railroad was paralleled for about a mile on the side hill above it to a second crossing of the canal, river and railroad. The line then followed for a short distance along the foot of the hill through which Indigo Tunnel is being driven to a crossing of the canal and river, leaving which the Baltimore & Ohio R. R. was paralleled for some distance on the river side of it to another crossing of the river and the canal, the present line being joined through a small valley just below the present first crossing of the river. A second line turned off just east of Indigo Tunnel, and, following around the base of the hill, joined the existing line just above the tunnel.

The first of the alternative routes was dearer than the accepted line, was 0.5 mile longer, and involved four crossings of the canal and river, as well as two of the railroad not required by that one. The second alternative line was to avoid the tunnel, but as it involved 1½ miles of work along the canal at least as difficult as the work above Sideling Hill Creek, the execution of so much construction of this character in a limited amount of time was believed to be too doubtful a matter of accomplishment to be considered.

Abutments and Piers.—The first crossing of the Potomac River and the canal consists of a 79-ft. 4-in. deck plate-girder span at each end, two deck riveted truss shore spans of 151 ft. 4 in. each, and two 152-ft. 8-in. channel spans, with a total length of 766 ft. 8 in. The two abutments and the five piers are all of concrete founded on solid rock. The east abutment is a U abutment, as are all those on the line that have earth filling behind. The parapet wall is 10 ft. 10¼ in. high and 2 ft. wide on top with a vertical front face. The back face is stepped three times, from the top down, with a 2-ft. 6-in. rise and a 9-in. offset in each step, making it and the back wall 4 ft. 3 in. in thickness from the footing to the lower step, 3 ft. 4¼ in. above the bridge seat. The bridge seat is 3 ft. 7 in. wide, extending the width of the abutment. An offset of 4 in. in the front and sides of the bridge seat wall, 1 ft. 6 in. below its top, forms the edge of the coping. From the coping to the foundation this wall is 3 ft. 3 in. thick, making the total thickness of the abutment wall 7 ft. 6 in. The wing walls are the same width on top as the parapet walls, and have three steps in their back faces similar to those in the back face of it, the rise being 2 ft. 6 in., but the offset 1 ft. In this particular case these walls are carried back to meet the rock slope rising abruptly behind the abutment, but in the majority of the abutments they extend from 8 to 20 ft. from the front face of the back wall. Filling material is placed as high as the bottom of the coping, above which it is sloped at 1½ to 1 to the track level and below on the same slope to the ground surface. These are the general dimensions of all abutments, their chief differences being in their heights and in the placing of a 1-ft. offset, 4 ft. above the base of the front face of those built on other than rock foundation.

The east pier is founded on four rows of piles, 20 piles to the row on 2-ft. centers, the rows being on 3-ft. centers. The outside rows are centered 1 ft. 5¼ in. from the edge of the footing. The lower footing course is 4 ft. thick, the piles extending up into it 2 ft. A 12-in. offset is made at the top of it, above which the second course rises 1 ft. 6 in. to a second 12-in. offset. The pier wall rises above this to a height of 16 ft. 6 in., with its faces battered ½ in. to the foot, being 6 ft. 6 in. wide and 36 ft. 1½ in. long at the lower edge of the coping. The coping extends 4 in. over the pier wall on all sides and is 1 ft. 6 in. thick. The upstream end of the pier is built with its sides at a 45 deg. angle with its transverse axis to form a cut water end, the nose of which extends 3 ft. 3 in. beyond the corner of the pier at lower edge of the coping. This nose was moulded to a circle by inserting within the forms a strip of No. 16 iron, 9 in. wide, bent to a 6-in. radius. It is held in place by 1-in. bolts, 9 in. long extending into the concrete. They have a welded head on the end outside the plate and a head and a 2-in. washer on end in the concrete. The other edges of the footing, the wall and the the coping were chamferred by placing a triangular strip with 1¼-in. sides in the forms. All river piers are built with these general dimensions, although most of them are higher and their footings are of such depth as to make the tops of the lower courses of each set of piers at the same elevation.

The other piers under this bridge are all built on solid rock with their neat work 30 ft. 3 in. high and their total height from 36½ ft. to 38 ft. The west abutment has a total height of 40 ft. 4¼ in., and is built on an earth foundation. Its general dimensions are similar to those of the east abutment. A total of 3,300 cu. yd. of concrete was placed in the foundations for this bridge.

A Lidgerwood cableway with a 950-ft. span was employed in handling the forms, concrete and other materials used in the construction of the foundation of this bridge. It was suspended over their site from a 70-ft. A frame tower on each side of the stream. The engines were 9x10-in. double cylinder, with a double 41-in. hoisting drum. The cableways handled an average load of 3 tons with a hoisting speed of 200 ft. per minute and a traveling speed of 600 ft. per minute. They placed the construction of these piers entirely independent of the stage of the water, and an unusually rapid progress was made in placing the concrete on their account.

The forms for the piers were made in sections 5 ft. high. When the first section above the footing course had been nearly filled a second section was placed on top of it and concrete placed in it. A third, was successively placed on it as the concrete neared its upper edge. The lower section was then removed by loosening the end and lifting it over the second and third sections and placing it on top of them by means of the cableway. The batter on the face of the pier was sufficient to hold the forms in place without support from beneath after the lower one had been removed. This method permitted the use of a minimum amount of lumber for forms, and if for any reason the work was stopped during the erection of a pier all but the top section could be removed and used elsewhere.

The concrete mixing plant was placed on the tow-path side of the canal a short distance from the path of the cableway. A narrow-gauge track was laid from the mixer to a point under the cableway and the skips used in conveying the concrete were handled from the mixer o the cableway in cars on it. A 2-yd. K. & G. cubical mixer was used in making the concrete, the batches being limited to 1¼-yd. About ninety batches per 10-hr. shift were placed under usual working conditions. The broken stone for the concrete in these foundations was brought down the canal from a crusher plant, which was installed by the contractors about four miles farther up on the canal. An Austin crusher was used, the rock being obtained from a quarry close to the plant. The product of this plant was employed in all the concrete work of the three lower bridges and most of the arches, culverts, etc., on the middle division. The cement was brought up the canal from a railroad station farther down, while the sand was obtained locally.

A fill from 20 to 40 ft. high and about 1,300 ft. in length, just beyond the first river crossing, contains 90,000 cu. yd. About 6,600 cu. yd. of this was placed from dump cars, the remainder being placed with dump wagons working in conjunction with a New Era grader, and by wheel scrapers. The fill had to be made almost entirely from borrow pits on either side of it, nine 2-yd. wagons and twelve 1-yd. wheel scrapers placing the material in it at the rate of about 25,000 cu. yd. a month, the season being practically free from rain. The fill is on a 5-deg. curve and was finished 20 ft. wide at the top with slopes of 1½ to 1. Owing to the fact that the river rises to within about 12 ft. of its top at the bridge end, about 1,000 yd. of rip-rap was placed along the upstream side and the river face to prevent damage being done to it by ice and floating logs.

Erecting Second-Story Bents of the Temporary Trestle at Bridge Five.

The line parallels the river from the end of this fill for about two and a quarter miles, following closely around the base of a hill of considerable height, to the second river and canal crossing. In the greater part of this district the construction required side-hill bench excavation, but as the material is clay and shale, and complications with the canal were not presented, no special difficulty was experienced in the work. A cut 900 ft. long and about 45 ft. deep, requiring 43,000 cu. yd. of loose and solid rock excavation is passed through just before going on to the second river bridge.

Second River Crossing.—This bridge is 1,366 ft. 10½ in. in length from parapet wall to parapet wall of the abutments on the opposite banks. It is made up of five river spans, a span over the canal, a plate girder span at either end and a viaduct of towers and plate girders. A 70-ft. deck girder extends from the east abutment to the first river pier. The two shore spans over the river are 151 ft. 4 in. in length, while the three channel spans are 152 ft. 8 in. long. The viaduct is made up of one 61-ft. 4-in. deck girder, three 65-ft. 1 5/16 in. girders, and three 30-ft. towers. It extends from the end of the west river span to the canal span, which is 125 ft. long. A 64-ft. 5½-in. deck girder carries the track from that span to the west abutment. The canal and river spans are riveted deck trusses supported on concrete piers and abutments, the viaduct being supported on concrete pedestals.

The east abutment has a total height of 45 ft. ½ in. with a back wall 3 ft. 6 in. thick and wing walls extending 11 ft. 6 in. from the front line of the back wall. Otherwise its general dimensions are the same as those of the abutments under the ends of the first bridge. The six river piers were built on a 25-deg. skew with the bridge in order to be parallel to the flow of the stream. They are 7 ft. wide and 39 ft. 9⅜ in. long under the lower edge of the coping, their cutting ends extending 3 ft. 6 in. beyond. They have 32 ft. 6 in. of neat work and a total height of from 37 ft. to 39 ft., the difference being in the footings, all of which are on solid rock.

A pedestal is placed under each of the four legs of the towers, which is 6 ft. square, in plan, on top and has 8 ft. of neat work above the footing, with sides battered 2½ in. to the foot. An 18-in. offset is made at the base of the neat work, below which a footing 4 ft. deep is placed. Two anchor plates are imbedded in each pedestal 1 ft. below the top of the footing. Through each of these is passed two 2¼-in. anchor bolts which extend up through the neat work and are attached to the base plates of the legs of the viaduct towers.

The piers under the canal span are 6 ft. wide and 36 ft. long at their tops under the coping, which is 1 ft. 6 in. thick and extends 4 in. over the edge of the pier walls. They are built with square ends, and have 15 ft. 6 in. of neat work, which is battered ½ in. to the foot. Their footings were carried to a depth of 5 ft. 6 in. and were made in two courses. The top course is 1 ft. 6 in. thick and 12 in. wider on all sides than the base of the neat work. The lower course has a 12-in. offset from the upper one, and is 4 ft. deep.

The two steps in the back of the parapet and wing walls of the west abutment have 6-in offsets and are 3 ft. thick below the steps. The total height of the abutment is 34 ft. 6½ in. The other dimensions are the same as those of the east abutment.

A Lidgerwood cableway was installed here similar to the one used at bridge one. The mixing plant was placed on the bank of the canal just outside of the tow path, and the concrete conveyed into place in skips on it. About 4,300 cu. yd. of concrete was required to build the foundations for this bridge.

Two lines alternative to the constructed one from a point just east of the first bridge over the river and the canal to a point just west of the second bridge were considered. One object was to avoid the two river crossings. This was to be accomplished by a line turning off from the constructed line just before reaching the first river crossing and paralleling the canal on the berme side. The other line was to avoid passing around the foot of the hill, the detour being eliminated by turning off to the left from the present line just above the big fill beyond bridge 1 and by driving a tunnel 2,300 ft. long through this hill.

The line paralleling the canal was considerably the cheapest, but was also the longest of the three projected ones covering this distance. It lies for nearly its entire distance on the steep, rocky berme side of the canal and about two miles of it is on such precipitous slopes as to render its construction over an operated waterway a matter of doubtful expediency. The tunnel line is 1.1 miles shorter than the constructed line, but the building of it was not justified either from the standpoint of constructive cost or from that of economical operation, when prospective traffic is considered. Furthermore, it can be adopted by abandoning the inexpensive part only of the present line, the bridges across the Potomac still being used.

Stick Pile Tunnel.—A short distance beyond bridge 2 the line passes through Stick Pile Tunnel, 1,670 ft. in length and the second on the line. It was driven by removing a top heading and then taking out the remainder of the section in two lifts. The top heading, 7 ft. high and 12 ft. wide, was cut the full length of the tunnel. The arch was then trimmed to shape by cutting away about 4 ft. on each side. The first life, 7 ft. deep, was next loosened by blasting and removed in 1-yd. cars on a narrow-gauge track. The second lift of 10 ft., extending 1 ft. below grade, is now being taken out, after which the tunnel below the arch will be trimmed to the required cross-section and the timbering put in place.

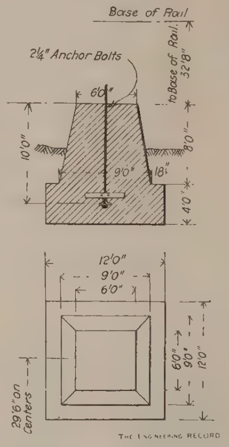
The material through which this tunnel passes is similar to that in Indigo Tunnel, the construction likewise having been carried on without requiring any timber bracing during its prosecution. The top heading was driven at the rate of about 500 ft. a month when a day and night shift of 15 men were working on each end. The trimming of the sides of this heading was done by the same men in 26 days and nights. In blasting the material in the heading, 22 holes, 8 ft. deep, containing about 50 lb. of dynamite, were drilled, this amount loosening the rock to a depth of from 4 to 5 ft. The top lift required 6 drill holes, 8 ft. deep, and 40 lb. of dynamite across the section, which broke up the rock for a length of 10 to 12 ft. so it could be removed.

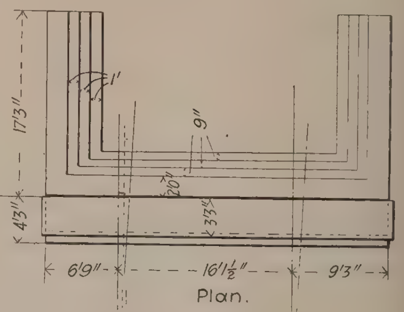
A plant containing a 24x30-in. Rand compresser, the steam for which is furnished by two boilers, one a 40-h.p. and the other a 60-h.p., was erected east of the tunnel near the canal and air is piped from it to both ends of the work. The line over the hill is a 4-in. pipe, 3,400 ft. long. Rand drills are used exclusively in making the blast holes, and are operated by air at a pressure of from 90 to 100 lb. per square inch. Winston & Co. & Locher have the contract for driving this tunnel. Mr. George Locher is the superintendent.

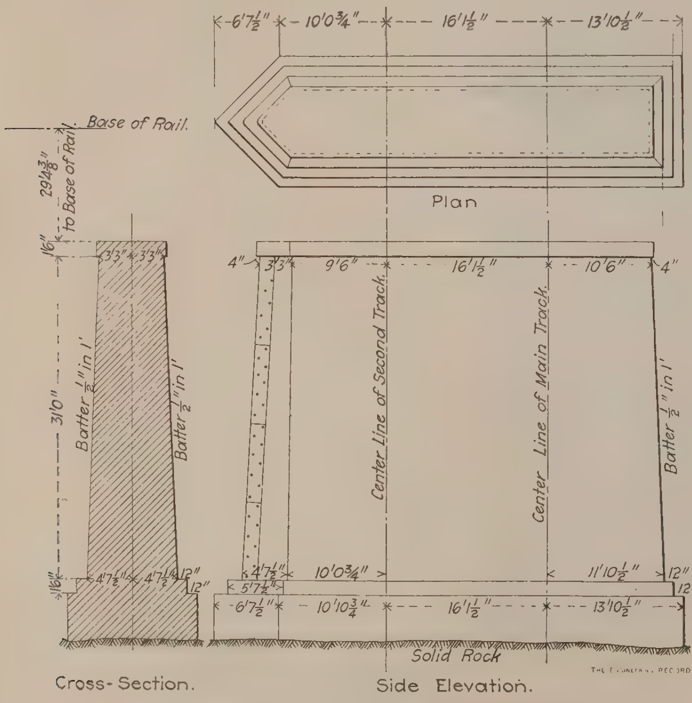
Third River Crossing.—A half mile beyond this tunnel is the third combined crossing of the canal and river. This bridge has a total length of 855 ft. 2½ in., and is composed of a viaduct, three channel spans and a plate girder span. The viaduct spans the canal and the low ground between it and the east bank of the river. It is made up of three deck plate-girder spans and two 30-ft. towers. One girder is 75 ft. 6½ in. long and other two 92½ ft. The two shore truss spans are each 151 ft. 4 in. in length, while the channel span is 152 ft. 8 in. long. They are deck riveted trusses, supported on four piers and the west abutment. The west tower of the viaduct is on four pedestals and the other tower on a pier and two pedestals. The east abutment has a total height of 28 ft. 4½ in. and was built without a footing course. The top of the parapet wall is 2 ft. wide and 7 ft. 10½ in. above the bridge seat. There are two steps in the back of this and the wing wall, 2 ft. 6 in. high, with 6-in. offsets. The wing walls are 14 ft. 6 in. from the front face of the back wall and 3 ft. thick. The bridge-seat wall is 3 ft. 3 in. thick below the coping, making the total thickness of the abutment wall 6 ft. 3 in.

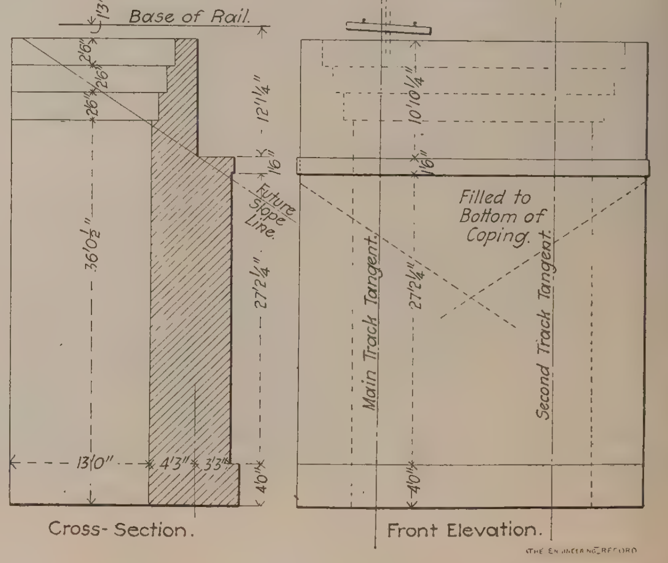
The shore legs of the east viaduct tower are supported on separate pedestals 6 ft. square on top and 12 ft. high above the footing. Their faces are battered 1½ in. to the foot and the 4-ft. footing on which they are placed has an 18-in. offset at the base of the neat work. They are built on five transverse rows of piles with six piles in each row spaced 2 ft. 3½ in. center to center, the centers of the outside rows being 1 ft. 5½ in. from the edge of the concrete. The pier upon which the other legs of the tower are to rest has not yet been erected. It is to be founded on five rows of piles with 14 in each row, spaced longitudinally at the same distances as those under the pedestals and transversely on 2 ft. 11¾ in. centers. The tops of these will be imbedded in a footing 4 ft. deep, the neat work being placed on it. It is to be 35 ft. 6 in. long and 6 ft. wide at the top, 13 ft. in height, with its faces battered 1½ in. to the foot.

The pedestals under the legs of the other tower are to be of the same general dimensions as the two just mentioned, the two to the east having 8 ft. of neat work and the other two 16 ft. All four are founded on piles spaced as in the other cases.









Concrete Bridge Pier and Bridge Abutment, and Pedestal under Steel Viaduct Tower Bents, Western Maryland R. R.

Two 2¼-in. anchor bolts, on 2 ft. 9¾-in. centers on the transverse center line, are placed in each pedestal and held in position by 48-in. anchor plates imbedded in the concrete.

The piers under the channel spans have 32 ft. 6 in. of neat work above the footing, and a total height of 40 ft. 6 in. Their other dimensions are the same as those of the first bridge. The west abutment has a total height of 43 ft. 6½ in., but otherwise is of the same dimensions as the west abutment of the first crossing. Approximately 3,300 cu. yd. of concrete was required to build these foundations.

A K. & G. cubical concrete mixer was set up on the bank of the canal, the arrangement being the same as at the first bridge. A Lidgerwood cableway was used to convey the concrete to the forms, which were manipulated in the same manner as at bridges one and two.

A Long Trestle.—A single-track pile trestle, 1,177 ft. long, extends from the end of this bridge across the low west bank of the river and over the Baltimore & Ohio R. R., to a point above it on the side hill. It is a temporary structure put in on account of the difficulty of securing material to make the fill until after the track is laid, when it can be filled by train.

The line passes up on to the hillside, after leaving this trestle, and turning, parallels the Baltimore & Ohio R. R. tracks, but 30 to 50 ft. above them on the edge of the hill. It continues in this manner for nearly 3½ miles to a second crossing of the railroad, and the fourth crossing of the river.

The construction of this portion of the line did not present any serious difficulties, although the work for the most part is side-hill loose and solid rock excavation. The grading from the trestle nearly to the next river crossing has been finished with the exception of about 1,000 ft. near the bridge approach. A side track, 5,900 ft. long, is to be placed just west of the trestle, and in this length the grading has been done for the two tracks. Otherwise it is all single track construction. The work on the 1,000 ft. which still remains unfinished embraces two cuts, one 300 ft. long and 20 ft. deep, the other 600 ft. long and 45 ft. deep, containing 55,000 cu. yd. of loose and solid rock. They are being made as rapidly as circumstances will permit, and the grading between the third and fourth river crossings will soon be ready for track laying.

Fourth River Crossing.—The tracks of the Baltimore & Ohio R. R. lie along the base of the hill on the bank of river at the fourth river bridge. The canal leaves the river valley about a mile below this point, and passing through a tunnel about ⅝ mile in length is not encountered again in the next three river crossings.

The fourth river bridge is a combined crossing of the railroad and the river, and has a total span of 1,028 ft. 11¾ in. It is made up of a viaduct, 361 ft. long at the east end, with plate-girder spans and trestle towers, and four deck riveted-truss spans over the river. The first girder at the east, 30 ft. 4 in. long, extends from the abutment at that end to the rocker bent supporting one end of the railroad span. This is a 74-ft. deck plate-girder span, provision being made for four tracks beneath it. From the end of this to the end of the bridge the viaduct contains three 30-ft. towers of two bents and plate girders, each supported on four separate pedestals, and of three 54-ft. ⅝-in. deck plate-girders. The shore spans at the river are each 151 ft. 4 in. long, while two 152-ft. 8-in. spans are placed over the channel, beyond which a 64-ft. 5½-in. deck plate-girder extends to the west abutment. The viaduct is on a curve, but the bridge is entirely on tangent.

The east abutment is placed high up on the side of the hill and is one of the smallest on the line. It has a total height of 16 ft. 4½ in., with wing walls extending back 9 ft. 6 in. from the front of the back wall.

The pedestals under the rocker bent, which carries the east end of the railroad span, are 6 ft. square in plan on top and are 8 ft. high above the footing. Their faces are battered 2½ in. to the foot, and at their base an 18-in. offset is made on all sides to form the top of the footing, which is 4 ft. deep. Four 1½-in. anchor bolts, 3 ft. 7 in. apart, transversely, and 2 ft. 9¾ in., longitudinally, are equally spaced around the center of the pedestals. They are held by an anchor plate imbedded in the concrete, 10 ft. below the top. The pedestals under the legs of the three towers are of the same dimensions as these, but are founded on piles. Those to the south, on the outside of the curve, are founded on 25 piles in five rows of five each, placed on 2-ft. 3½-in. centers. Those to the north, on the inside of the curve, have each 16 piles under them, which are spaced 3 ft. ⅝ in. on centers, in four rows. There are two 2¼-in. anchor bolts placed 16⅞ in. on either side of the center, on the transverse center line.

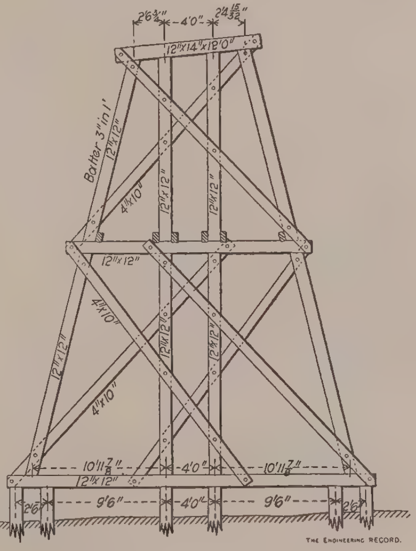
The five piers under the river spans are built on the solid rock, which lies at a depth of from 2 ft. to 4 ft. below the bed of the river. They are 32 ft. 6 in. high above their footings, which are from 4 to 5 ft. high. They have a total width at the top of 36 ft. 1½ in., with an upstream cutting nose extending 3 ft. 3 in. beyond. Their other dimensions are the same as those on the standard piers under the bridges farther down.

The west abutment of this bridge is one of the tallest of any that have been built in the construction of this road, having a total height of 51 ft. ½ in. The back and wing walls have two steps in their back faces, each 2 ft. 6 in. high, those in the back wall having a 9-in. offset, while those in the wing walls have 1-ft. offsets. The wing walls extend 11 ft. 6 in. back from the front face of the back wall. The bridge seat is 8 ft. below the top of the parapet wall, the wall under it being 3 ft. 3 in. thick, making, with the back wall, the total thickness of the abutment 6 ft. 9 in. below the coping.

The Lidgerwood cableway, which was used in erecting the foundations at one of the other river crossings, was set up over the site of these foundations. The head tower and hoisting engine were placed near the west abutment and the tail tower on the hill over the railroad tracks on the opposite side. A rock crusher was installed under the head tower, the product from it being elevated by a bucket conveyor to an overhead storage bin. A sand bin was also set up, and chutes placed in the bottom of both these bins fed the materials from them into a measuring box below. A 2-yd. K. & G. cubical mixer, placed under this box, was employed in making the concrete, which was made in 1¼-yd. batches and conveyed in skips to the forms by the cableway. These foundations contain 3,550 cu. yd. of concrete.

The Kessler Tunnel.—Two thousand feet beyond this bridge is the third tunnel on the line, known as the Kessler Tunnel. It is 1,835 ft. from portal to portal, and is being driven through solid rock. The east approach is through a narrow valley, between hills rising abruptly on either side of it. Lack of head room required a cut in solid rock through the bottom of this valley for about 1,500 ft., before a tunnel could be commenced. This cut is from 20 to 100 ft. deep at the sides, while in some places the slopes have broken out so as to cause the slopes to extend even higher than that. It contains approximately 100,000 cu. yd. of excavation, although much more than that will probably have to be removed before the sides are made to hold. As the valley was formerly the drainage outlet for a considerable area of very rugged hills, a large volume of water came upon the work at times with great suddenness. The disposition of this water occasioned considerable trouble in the early stages of the work, and a flume was finally built along the hillsides, which delivered the water some distance below the cut.

A 2-yd. Marion steam shovel was placed in the cut early in the work and is used in conjunction with two Porter engines, hauling four 2-yd. dump cars each, to a dump near the river.



Typical Bent of Temporary Trestle.

On account of the difficulty of getting to the east portal, only the west heading has been started, the full section of the tunnel being removed in one cut. Ingersoll-Sergeant drills are used in making the blast holes, and are operated by compressed air at about 100 lb. per square inch pressure. The drilling and blasting is all done at night, an electric lighting plant having been installed; the removal of the loosened material taking place in the daytime. Working in this manner, a progress of about 8 ft. a day is being made. The east heading will be started as soon as the approach to it has been sufficiently opened to permit work.

A plant containing an Ingersoll-Sergeant 24x24¼x30-in. air compressor is placed on the east bank of the river at the fourth crossing, in order to be conveniently located to the railroad. Four Erie boilers furnish the steam for the plant. A 4-in. pipe line, over a mile in length, conveys air to the west heading for operation there, a branch being taken off to supply the drills at the east end.

The Fifth River Crossing.—The west approach to this tunnel is only about 300 ft. long, the hill dropping away from the portal to the river below, which is crossed on a bridge with four deck riveted-truss spans, and a plate-girder span at either end. The girders are each 64 ft. 5½ in. long. The shore spans are both 126 ft. 3 in., the channel spans being 127 ft. 6 in. long. The east abutment is but 9 ft. deep below the coping of the bridge seat. The top of the parapet wall is 7 ft. ½ in. above this, and 2 ft. wide on top, with two steps 2 ft. 6 in. high and 9 in. wide in its back face. The north wing wall extends back 20 ft. from the front of the back wall to the rock in the hillside, while the south one is but 11 ft. 6 in. long. Both are 2 ft. wide on top and have two steps each 2 ft. 6 in. high, with 12-in offsets. The whole abutment is founded on the rock of the almost vertical river bank.

The five piers rise 39 ft. 3 in. above their footings, 6 ft. 6 in.x33 ft. 4 in. in plan at the lower edge of the coping. They are all placed on solid rock, their footings ranging from 4 ft. 6 in. to 5 ft. 6 in. high. Their general design is that of the standard river pier at the lower crossings. The west abutment has the same dimensions as the one on the west at the fourth crossing. These foundations required 3,300 cu. yd. of concrete to build them.

In placing the concrete in these piers, forms in 5-ft. sections were used as in the lower bridges, but they were manipulated in a different manner. A temporary pole trestle was thrown across the river and a narrow-gauge track placed on it, over which dump cars, carrying the spoil from the tunnel heading, were operated. Cars conveying the concrete from the mixing plant to the forms also ran over it, the concrete being dropped from them into place through chutes. The trestle was erected with two-story bents, the lower bents being placed and used until the concrete had reached their tops, when the second story was erected on top of it. Only one 5-ft. section of form was used on each pier. When it was about filled the end pieces were loosened and the form raised about 4 ft. with blocks and tackles on the trestle overhead. Work was so planned as to give the lower 4 ft. of the 5 ft. in the form at least an overnight set. In this manner the concrete was carried to the top and the forming of joints, which was evident to some extent in the faces of the piers on the work farther down, was avoided.

The concrete was mixed in a 1½-yd. mixer on the east bank. A No. 5 Austin crusher was set up here, and the broken stone from it elevated by a conveyor into a storage bin, which delivered through an opening in its bottom into a measuring box. A sand bin also had an outlet in this box, which, in turn, delivered to the mixer.

The Sixth River Crossing.—The sixth river crossing is less than a half-mile beyond this one. Just beyond the fifth bridge is a fill about 1,000 ft. long and 40 ft. high, while beyond it is a cut requiring the excavation of about 65,000 cu. yd. of loose and solid rock. This cut extends to the sixth river crossing, which has a span of 651 ft. 3½ in. It has a superstructure of the same size, and spans as the fifth, with the exception of the girder from the east abutment to the river pier, which has a span of 79 ft. 4 in.

The foundations are almost of the same dimension as those under that bridge, except the east abutment has a height of 42 ft. 10½ in., a back wall 4 ft. 3 in. thick, and wing walls 17 ft. 3 in. long; they contained nearly 3,600 cu. yd. of material. The piers are also shorter, having 37 ft. of neat work, but in other dimensions they are practically the same as those under the bridge just before it.

The concrete for these piers and abutments was mixed in a 1-yd. Ransome mixer, set on the east bank. It was placed through chutes from cars on a temporary pole trestle in the same manner as in the bridge foundation just mentioned. The stone was obtained from the crusher at that bridge, being hauled on a narrow-guage track. The forms were manipulated in the same manner, single 5 ft. sections being used on each pier.

A fill 600 ft. long and about 35 ft. high, and a small cut beyond it carries the line to the fourth canal crossing and the end of the second division at Paw-Paw. Six lines were surveyed, located and estimated between the trestle at the end of bridge 3 and this point. The line which was chosen, and is being constructed, is the shortest of any, but with one exception the most expensive. From a standpoint of comparative economical operation, it ranks third among the other lines up to a traffic equal to that of double-track competing lines. At that traffic, even, it ranks second, but as the other lines all involved more legal and physical difficulties than this one, the construction of it was believed to be the best.

(To be continued.)

Reconstruction of the Moncreiffe Tunnel.

The reconstruction under traffic of the Moncreiffe tunnel on the Caledonian Railway, near Perth, Scotland, was described in a paper by Mr. D. McLellan, read recently before the Institution of Civil Engineers. This tunnel was built in 1848. It is 3,654 ft. in length, 2,526 ft. of which were lined with brickwork, while the remainder was left unlined. The reconstruction was necessitated by the deterioration of the brickwork in the lined portions and the disintegration of the rock in some of the unlined portions. The reconstructed tunnel has 3,249 ft. lined with brickwork and the remaining 405 ft. is unlined.

As a part of the reconstruction the cross-section of the tunnel was increased, the new section having vertical side walls and a segmental-arch roof. The tracks were also raised at the same time to give room for more ballast between the ties and the rock of the tunnel floor. The minimum thickness of the brick side walls is 9 in., and that of the arch 18 in., while their average thickness is 1 ft. 8 in. and 2 ft. ¾ in., respectively. The ground water which reaches the tunnel arch is carried down on the extrados to channels leading to chimney drains built in the side walls. These drains are connected by pipes built in the side walls to larger longitudinal drains laid on the rock close against the side walls and leading to either end of the tunnel.

An electric lighting and air plant which furnished light and air to the workmen in the tunnel, a 3-ton derrick crane, a protective platform built over the railway track at the crane, and other temporary works were placed near the north portal. The work in the tunnel was carried on with the aid of four steel traveling shields, 32 ft. long, 22 ft. wide, and 16 ft. 8 in. high. Each shield was built in two parts that were rigidly bolted together and could be easily separated. Traffic was handled on a single track laid down the center of the tunnel and passed through openings 13 ft. 8 in. wide by 13 ft. 6 in. high, in the shields. These openings were lined with timber as a protection both to the traffic and to the workmen on top of the shield. The excavated and building materials were handled in small cars on narrow tracks laid from the shields to the north portal, where the materials were handled by the 3-ton crane.

In the reconstruction of the originally unlined portion of the tunnel the side walls were built clear of the shields and ordinary timber tunnel-arch centers were used in building the arch, the shields merely serving as a protection. In the reconstruction of an originally lined part of the tunnel in soft ground, the old brick lining was supported from the leading end of the shield, and a top heading driven over the extrados of the old arch to allow the two center crown bars to be drawn. The old arch was then taken out, beginning at the crown, and the length timbered as in ordinary tunneling, the bars being supported at the back from the new brick arch and at the front from one of the ribs of the leading half of the shield. When the top heading in a 12-ft. length was excavated and timbered, the rear half of the shield was detached and moved back to the last length, where it was used as a scaffold in removing the timber arch centers. While the two parts of the shield were separated the side walls were built, then the rear half of the shield and the arch centers were moved to their new position and another length of the brick arch built.

Seven days were required to complete a 12-ft. length of originally unlined tunnel, 11 days for a 12-ft. length of originally lined tunnel in soft ground, and 8 days for a 12-ft. length of originally lined tunnel in rock. There were three 8-hour shifts of miners and one shift of bricklayers, 150 men being daily employed. One year and 11 months were required to complete the reconstruction work proper inside the tunnel.

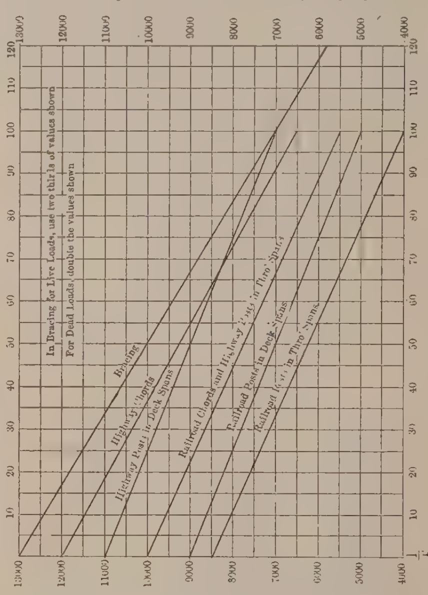


Diagram for Compression Members.

Letters to the Editor.

Diagram of Unit Strains in Compression Members.

Sir:—Perhaps the enclosed diagram would save time to some of your subscribers who have occasion to use Cooper's specifications frequently. I have used a similar diagram for other compression formulæ and recently made this one as a revised edition of a rougher set of lines that I had been using. It may be that such a diagram has been published in your columns, but I have not happened to see it.

Yours truly, A. W. A. Eden.

New Haven, Feb. 13.

Engineering Handbooks.

Sir:—In your issue of Feb. 4 you had a very interesting article on engineering handbooks, in which you deprecate the present style of handbook, and with good reason, and suggest a type of handbook which every engineer has been looking for for years. The trouble is to get competent engineers to take the time to put the data covering their particular specialties into such shape as would be desirable for publication in such a handbook.

The question is how to bring it about. You state "it would, of course, not be lucrative to those engaging in it, for technical authorship is rarely productive of direct financial returns," and right here I think you have struck the keynote of the situation. Most of us do not care to spend the time, without any remuneration at all, in transcribing the work from our private notebooks so as to be ready for publication, and, in the present state of commercial engineering, where so much engineering work is either given away or used for "bait" by manufacturers and construction companies, there is a great tendency among the craft not to give away short cuts to our rivals (in business).

Two methods seem possible to the writer. One is for some publishing house, making a specialty of technical publications, to pay competent specialists to send in the data regarding their special class of work, and then bring out the work as a whole.

The other, which some of the engineers engaged in private practice have already adopted, is to exchange with each other typewritten, manifold pages of a size convenient for insertion in engineering notebooks.

The writer would suggest a notebook sheet which fits an adjustable binder, and would say for one that he would be at all times more than willing to furnish such data as he has regarding dynamical work, compressed air, power economics, combustion, hydraulic engineering pertaining to water wheels, reciprocating and centrifugal pumps, with any other consulting engineer in private practice who will reciprocate with data in his particular specialties.

It would not always be feasible to so exchange with engineers solely employed by commercial houses, for the reason that a considerable part of the data is oftentimes worked up for a commercial rival of the parties employing this engineer, and right here it seems to me to be a proper place to advocate a more definite standing of the consulting engineer.

Until we get some "esprit de corps," such as inhabits the medical profession or the military engineers, we are hopeless in ever getting a proper recognition of the engineering profession.

Yours very truly, Wm. O. Webber.

Boston, Feb. 20.

The Pittsburg Terminal Warehouse.

Sir:—In the article you published on Feb. 25, regarding test of new floor which is to be used in the Pittsburg Terminal Warehouse & Transfer Co.'s warehouses, this city, you mentioned that Messrs. Kindl & Glafey were the engineers in connection with Mr. Bickel on this operation. It seems that we misinformed you as to this, and find that Messrs. Kindl & Glafey are the engineers for the power house only and had nothing whatever to do with the building proper. We respectfully ask you to make this correction in your next issue on behalf of Architect Bickel.

Yours very truly,
National Fire Proofing Co.

Pittsburg, March 7.

The Traveling Cableways used on the foundations of the Port Morris power station, which were described in this journal last week, were erroneously stated to be of the Cherry-Laurent type. The makers, the Lambert Hoisting Engine Co., of Newark, state that the Lambert system of simultaneous hoisting and conveying was used. The cableway at the Charleston dry dock, described in the same issue, was also of this type.

CURRENT NEWS SUPPLEMENT

MARCH 11, 1905.

E TORY OF NATIONAL ENGINEERING SOCIETIES.

CAN SOCIETY OF CIVIL ENGINEERS.
t, Chas. Warren Hunt, 220 West 57th
York.

CAN SOCIETY OF MECHANICAL ENGI-
s. Secretary, F. R. Hutton, 12 West 31st
York.

CAN INSTITUTE OF ELECTRICAL ENGI-
s Secretary, Ralph W. Pope, 95 Liberty
York. Next meeting, New York,
h 4; papers by Ernest Gonzenbach, on
ion of high-pressure to electric rail-
by Geo. A. Damon, on high-pressure
struction for electric railways; and
Varney, on the high-pressure trolley.

ICAN INSTITUTE OF MINING ENGI-
s Secretary, R. W. Raymond, 99 John
York.

ICAN INSTITUTE OF ARCHITECTS.
ty, Glenn Brown, Washington, D. C.

IATION OF ENGINEERING SOCIETIES.
y, John C. Trautwine, Jr., 257 South
t St., Philadelphia, Pa.

ICAN SOCIETY OF HEATING AND VENTI-
ENGINEERS. Secretary, W. M. Mackay,
ter St., New York.

DIAN SOCIETY OF CIVIL ENGINEERS.
y, Clement H. McLeod, 877 Dorchester
ntreal.

TY FOR THE PROMOTION OF ENGINEER-
DUCATION. Secretary, Prof. M. S.
m, University of Colorado, Boulder,

RICAN SOCIETY FOR TESTING MATE-
Secretary, Prof. Edgar Marburg, Uni-
of Pennsylvania, Philadelphia, Pa.

RICAN SOCIETY OF MUNICIPAL IM-
ENTS. Secretary, George W. Tillson,
12, Municipal Building, Brooklyn, N. Y.

CIATION OF RAILWAY SUPERINTENDENTS
DGES AND BUILDINGS. Secretary, S. F.
on, Concord, N. H.

RICAN RAILWAY ENGINEERING AND
ENANCE OF WAY ASSOCIATION. Secre-
. C. Fritch, 1562 Monadnock Block, Chi-
Annual meeting at Chicago, March 21,
23.

RICAN WATER-WORKS ASSOCIATION. Sec-
J. M. Diven, Charleston, S. C.

RICAN FOUNDRYMEN'S ASSOCIATION.
ary, Richard Moldenke, P. O. Box 432,
ork.

INE BUILDERS' ASSOCIATION OF THE
STATES. Secretary, J. L. Lyle, 39
dt St., New York.

A NEW CONVEYOR.

Brown Excavating Machine Co., 538
St., Brooklyn, N. Y., has brought out
conveyor which is noteworthy for the
of bolts, bars, nuts, screws and ma-
work, and for its general simplicity in
ction. As a result of its limited num-
parts, it is felt that it promises mini-
ost of maintenance and minimum fric-
hile its other positive characteristics
accessibility for repairs, rapidity and
ith which buckets can be attached or
d, portability and non-reversibility.
mpany has designed several types of
to meet the various requirements and
usage incident to heavy service, and
nveyor is a part of an excavating
on which patents were allowed Feb.
which the company is now building.
ccompanying engraving shows a per-
e view of the upper traction wheels,
and couplers in actual operation.

recesses in the face of the rim of the
wheel are to receive the lugs of the
s, these lugs being similar in office to
rockets of a sprocket wheel. The two
ke portions of the coupler are formed
ive the journals of the bucket. The
s are carried by two clips which are
to the back of the bucket. This
ement, it is stated, is merely tentative.
, a steel casting of the required length
h the bearings of the couplers will be
At each end it will receive the hooks
coupler and will probably be riveted to
ck of the bucket, although it can be

The almost circular holes in the side of the traction wheel are beneath the recesses in the wheel rim, into which the lugs of the couplers meet. The holes are a continuation of the recesses and serve to allow for the discharge of any material that may enter the recesses. A turn-buckle with hooks slightly turned at each end is used for detaching any particular bucket. It is gripped to the top of the back of the bucket above as well as to the bottom of the bucket below the bucket to be removed. By contracting the turnbuckle, the bucket desired is released and can be quickly removed and another replaced.

The non-reversible feature is indicated in the half tone. As soon as the lugs of the couplers leave the recesses, the couplers fall into a position that makes it impossible for the lugs to re-enter the recesses in case of a reverse motion. The couplers in this position become brake shoes in case of a reverse motion.

BUSINESS NOTES.

In April next the business of McDowell, Stocker & Co., Chicago, will have been established ten years. The foundation of the firm was principally laid on its sale of second-hand machinery, but the partners, Messrs. David McDowell and H. A. Stocker, gradually acquired the agency for excellent lines of new machines. In 1899 the business was incorporated, and in 1903, inadequate space made it necessary to lease the entire building at 59 and 61 South Canal St., Chicago. David McDowell died in June, 1904. At that time his son, Mr. W. J. McDowell, a graduate of the University of Chicago, and Mr. E. L. Essley, who had been in the employ of the company for five years, and interested in the machinery business for 15 years, were negotiating for the purchase of Mr. Stocker's interest, but it was not until December, 1904, that the matter was finally consummated. Mr. McDowell was made president and Mr. Essley secretary and treasurer.

The Sweet & Doyle Valve Co. has been incorporated with a capital of $75.000. The incorporators are H. M. Sweet, E. C. Doyle and J. E. MacLean, all of Cohoes, N. Y.

The Lackawanna Mfg. Co., Newburg, N. Y., has been incorporated, with a capital of $20,000, to manufacture motors and engines. The incorporators are T. and W. H. Caldwell and A. W. Mapes.

It is stated that final papers for the transfer of the Philadelphia Pneumatic Tool Co. to the Chicago Pneumatic Tool Co. have recently been signed at the offices of the Chicago company. It is also stated that the plant of the Philadelphia Pneumatic Tool Co. will be kept in operation with Julius Kellar in charge.

It is reported that M. A. Hanna & Co., Cleveland, O., have secured the contract for part of the pig iron which will be used in the Pennsylvania R. R. tunnels under the North and East rivers. The order is stated to be for 300,000 tons of No. 3 foundry grade of pig iron, and the metal will be used for casting segments for the tunnels. It will be delivered in three years' time, 100,000 tons each year. M. A. Hanna & Co. will not cast the iron segments, which will be 24 ft. in diameter when bolted together, and will be 3½ ft. wide. The firm does not operate a foundry and proposes to let the contracts for casting the pipe out to several firms, who will buy the pig iron from it at market prices.

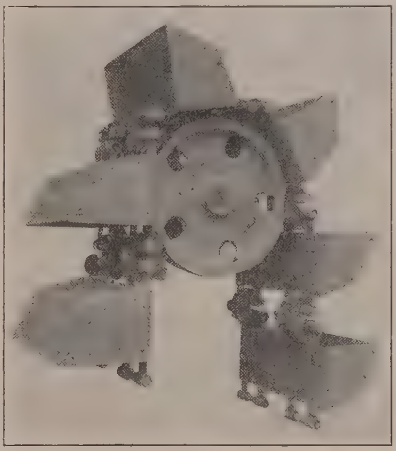
The Fawcus Machine Co., Pittsburg, Pa., is preparing to increase its plant to about double its present capacity. The extension will be chiefly in the line of manufacturing larger gears and heavier machinery than formerly.

The Oliver Iron Mfg. Co., of Duluth, has ordered from the Allis-Chalmers Co. four new engines for use in the Minnesota mines owned and operated by them. The engines are each of the Reynolds Corliss cross compound heavy duty type, with cylinders 18x34 in. in diameter and a 34-in. stroke.

An order for three 300-kw. alternating-current generators has been placed with the Westinghouse Elec. & Mfg. Co., by the Barber Lumber Co., Boise, Idaho. These machines will generate current at 440 volts, which will be transformed to 23,000 volts for transmission. The necessary transformers, switchboards and lightning arresters are included in the apparatus to be furnished.

The directors of Warren Brothers Co., of Boston, have appointed George C. Warren, formerly vice-president and general manager, president of the company to fill the vacancy caused by the death of Frederick J. Warren; and have appointed Walter B. Warren, formerly assistant general manager, as general manager. The other officers of the company remain unchanged and are as follows: Hon. J. M. Head, vice-president and general counsel; Albert C. Warren, treasurer; Ralph L. Warren, secretary; Charles O. Warren, general superintendent.

The Foundation Co., 35 Nassau St., New York, has lately been awarded two contracts, one at New Orleans, La., for the construction of the sea wall and slip of the New Orleans Terminal Co., at Chalmette, below New Orleans, on the Mississippi River. This contract is part of a general contract for the whole terminal system, obtained by James Stewart & Co., amounting to over two million dollars. The foundations of the sea wall are to be laid in a depth of about 40 ft. of water, resting on piles. The height of the wall, which consists of concrete, is 55 feet, and is designed so that ocean steamships of great draft can come alongside, as a depth of 30 ft. of water is provided for a low water. The other contract is for the sinking of a caisson for the foundations of an extension to the power house of the Union Electric Light & Power Co., St. Louis. The power house of this company is situated on the waterfront and a great deal of trouble has been experienced in providing a foundation for an extension of it. Several methods have been tried and have proved failures. It was finally decided to adopt the pneumatic process and this company was awarded the contract to execute the work.



BROWN EXCAVATING MACHINE CONVEYOR.

PERSONAL NOTES.

Mr. James Omberg has been re-elected city engineer of Memphis, Tenn.

Col. Geo. W. Miles, president of the Radford, Va., Water-Power Co., died Feb. 25, in Richmond, Va.

Asst. Prof. L. C. Herdt, of McGill University, Montreal, has been made an officer of the French Academy.

Mr. Charles A. Hague, consulting engineer, will remove his office, May 1, to 52 Broadway, New York City.

Mr. Arthur W. Dean, of Nashua, N. H., has been appointed State highway engineer of New Hampshire.

Mr. E. W. Marshall has severed his connection with the Otis Elevator Co., in order to practice patent law at 43 Wall St., New York.

Mr. Fred A. Jones, consulting electrical, mechanical and hydraulic engineer, has moved his offices to the Dorrance building, Houston, Tex.

Messrs. Ross & Holgate, consulting electrical engineers, Montreal,, have been retained by the Niagara Power Commission to investigate the feasibility of supplying power in a number of Ontario cities from Niagara.

Mr. William Barclay Parsons, formerly formerly chief engineer of the Rapid Transit Commission of New York City, and since his resignation from that position, consulting engineer to the same Commission, has resigned from the latter position.

Mr. A. Lincoln Fellows, district engineer of the U. S. Reclamation Service, in charge of the Gunnison River works, has severed his connection with the federal government in order to accept the office of State Engineer of North Dakota. His home will be in Bismarck.

Mr. H. J. Barron, who has been engaged for a considerable number of years in New York City in the design and installation of heating and ventilating plants, has joined the New York office of the Green Fuel Economizer Co., 74 Cortlandt St., in connection with the sale of blowers, heaters, ventilating fans and the like.

Mr. D. W. Cole has been appointed constructing engineer in the U. S. reclamation service and assigned to the dam on the Shoshone River, near Cody, Wyo. Mr. Cole has heretofore been connected with the surveys and construction of works for additional water supply for the cities of New York, Boston, Mass., and Waterbury, Conn.

At the second annual meeting of the Sanitary Section of the Boston Society of Civil Engineers, held March 1, the following officers were elected for the ensuing year: Chairman, Harrison P. Eddy, Worcester; vice-chairman, Chas. R. Felton, Brockton; clerk, Wm. S. Johnson, Boston; executive committee, Freeman C. Coffin, Boston; A. D. Marble, Worcester, and Leonard Metcalf, Boston.

Mr. Arthur Adams, assistant engineer in the Rome office of the New York State barge canal improvements, has been appointed construction engineer of the new power plant to be built by the Edison Sault Electric Co., of Sault Ste. Marie. The president of the company, Mr. Alex. Dow, of Detroit, and Prof. Gardner S. Williams have prepared plans for the work, which is rendered rather difficult on account of the peculiar conditions under which the foundations must be constructed.

Mr. Edward Longstreth, a retired member of the firm of Baldwin's Locomotive Works, died Feb. 23, at his home in Philadelphia, Pa. Mr. Longstreth entered the Baldwin Locomotive Works in 1857, as an apprentice and was rapidly advanced until 1867, when he was made general superintendent of the works. He was admitted to partnership in 1870, but retained control of the mechanical and construction departments. He retired from business in 1886, owing to impaired health.

Mr. L. C. Fritch has been appointed assistant to the general manager of the Illinois Central R. R. He entered the engineering department of the Ohio & Mississippi R. R. in 1884 as assistant engineer and became engineer of maintenance of way in 1892. In 1893 he became a division engineer of the Baltimore & Ohio Southwestern R. R. and in 1899 was appointed superintendent of the Mississippi Division. In 1904 he undertook special work for the asistant general manager of the Illinois Central R. R. He has been secretary of the Am. Ry. Engineering and Maintenance of Way Association since its organization.

Mr. Burr Bassell died suddenly on Feb. 25, of spinal meningitis, at his home in Los Angeles, Cal. Mr. Bassett was a graduate of Washington and Jefferson College, in the class of 1881, and afterward attended the LeMoyne School of Applied Mathematics and Engineering for three years. From 1884 to 1887 he was connected with engineering work in California and since then he had devoted his time largely to hydraulic work throughout the West. He was resident engineer in charge of construction of the Tabeaud dam and tunnel at Electra, Cal., and for the past three years resident engineer of the Kern River Co., in charge of canal construction and hydrographic work. He recently received an appointment as chief engineer of construction of a large dam at Wichita Falls, Tex., and was preparing to go there at the time of his death.

Capt. R. B. Pegram, formerly assistant general manager of the Southern Ry., died in Memphis, Tenn., March 3. Mr. Pegram entered railway service in 1867, in the mechanical department of the Chatham Ry., and afterward entered the engineering department. He remained in engineering positions with various southern roads until 1877, when he was appointed master of transportation of the Memphis & Charleston Ry. He was superintendent of the International & Great Northern R. R. for a time, following his connection with the latter road. From 1881 to 1898 he was with the Memphis & Charleston Ry. as superintendent, and afterward general superintendent. He was appointed superintendent of the Memphis division of the Southern Ry. in 1898 and then, in 1901, assistant general manager of the same railroad, which position he held until his resignation to become president of the Vera Cruz & Pacific Ry.

Mr. R. C. Luther, second vice-president of the Philadelphia & Reading Coal & Iron Co., died March 6, after an illness of one week. Mr. Luther's early experience was in the office of Stephen Harris, a mining engineer, after which he took a course in mining engineering at the Polytechnic College in Pottsville, Pa. In 1867 he accepted an engineering position with the Wilmington & Northern R. R. and remained with that road until 1870, when he was appointed to a mining engineering position with the Philadelphia & Mahanoy Coal Co. When that company was absorbed by the Philadelphia & Reading Coal & Iron Co., in 1871, Mr. Luther was made engineer in charge of the Mahanoy and Shenandoah districts, in which capacity he served until 1874, when he was sent to West Point, N. Y., as superintendent of the ore mines owned there by his company. He resigned in 1875 and went to Nevada to engage in silver mining, where he remained for seven years and then returned to accept an engineering position with his former company. He was made general superintendent in 1888 and second vice-president in 1902.

Mr. L. F. Loree, who resigned last fall the chairmanship of the executive committee and a directorship of the Chicago, Rock Island & Pacific Ry., announced on his recent return from abroad that he would in the future be connected with the Canadian Pacific Ry. Mr. Loree was educated at Rutgers College and began his railway career in 1877 in the engineering department of the Pennsylvania R. R., in which work he remained until he was made a transitman in the Engineer Corps, U. S. A., in 1879. After two years' service in the government corps, he spent two years on the preliminary survey and location of the Mexican National Ry. He returned to the employ of the Pennsylvania Co. in 1883, as assistant engineer on the Chicago division, and advanced through different departments of that company until he was made general manager and fourth vice-president of the Pennsylvania Lines west of Pittsburg, in 1901. His resignation from the latter position to become president of the Baltimore & Ohio R. R., and his subsequent resignation from that position to become associated with the Chicago, Rock Island & Pacific Ry., are too well known to need comment.

Mr. R. S. Hayes, for nearly forty years prominent in railroad affairs in this country, died recently, at his home in New York City. Mr. Hayes entered railway service in 1867 as assistant engineer on the Erie Ry., having previously been employed two years in locomotive shops at Paterson, N. J. He was appointed chief engineer and general manager of the Texas & New Orleans R. R. in 1870, and was afterward connected with the Texas & Pacific R. R., as chief engineer of the company which built the road and later as chief engineer of the road. He became chief engineer of the International & Great Northern R. R. in 1874, vice-president and general manager of the same road in 1875, its receiver in 1878, and president of it in 1879. He was made first vice-president of the Missouri Pacific, Missouri, Kansas & Texas, Texas & Pacific, and St. Louis, Iron Mountain & Southern Rys., in 1881. In 1883 he became first vice-president of the Wabash, St. Louis & Pacific Ry., and in 1888 was made president of the St. Paul & Duluth R. R. From 1888 to 1894 he was also president of the New York & Northern Ry., and was receiver of the Central Railroad & Banking Co., of Georgia, from 1893 to 1895.

CONTRACTING NEWS

OF SPECIAL INTEREST TO

CONTRACTORS, BUILDERS, ENGINEERS AND MANUFACTURERS

OF ENGINEERING AND BUILDING SUPPLIES.

WATER.

Notes Arranged Alphabetically by States.

Vallejo, Cal.—W. J. Torney, City Clk., writes that it was voted Feb. 27 to issue $90,000 bonds for laying new water mains.

South Norwalk, .Conn.—Chris. Swartz, Chmn. Water Comrs., writes in regard to the construction of a filter plant, that the extra appropriation needed for its construction has not been granted, so that no filter will be constructed for the present.

Ft. Valley, Ga.—See "Power Plants, Gas and Electricity."

Eureka, Ill.—F. B. Jeaupert, City Clk., writes that it is proposed to construct water works, to cost about $10,000.

Onawa, Ia.—The Council is reported to have under consideration the question of constructing water works.

Augusta, Me.—The Augusta Water Dist. will shortly contract for the laying of 8¼ miles of 24-in. pipe to Carleton Pond, for a new water supply. W. B. Getchell, City Engr.

Orone, Me.—It is reported that Chas. N. Taylor, of Wellesley, Mass., will construct water works for Orone, Webster and Basin Mills.

Boston, Mass.—Bids will be received until Apr. 6 by Maj. John E. Baxter, Q. M., U. S. A., Boston, for furnishing material and constructing a submarine pipe line from Nut Island to Peddocks Island, Mass.; for a 6-in. water main on Peddocks Island and a post water works system at Ft. Andrews, Boston Harbor, Mass. Plans, specifications, etc., may be obtained on a deposit of $5, the same to be refunded on the return of the plans.

Uxbridge, Mass.—According to the report of the Water Com., the estimated cost of an additional water supply is stated to be $75,790.

Lawrence, Mass.—The Water Bd. and Comrs. are stated to have on Mar. 1 decided to make a trial of driven wells as an auxiliary to the present water supply system.

**Worcester, Mass.*—The U. S. Cast Iron Pipe Co., of Burlington, N. J., is stated to have secured the contract for c. i. pipe at $26.40 per ton for 6 and 8-in. pipe, $25.90 for 10 and 12-in. pipe, and $25.20 for 16-in. pipe.

Springfield, Mass.—The City Council on Feb. 28 passed the order authorizing the Water Comrs. to investigate the question of a water supply, in accordance with the recent report of the State Bd. of Health.

Russell, Mass.—The citizens are reported to have voted Mar. 6 to construct water works.

Clare, Mich.—Bids will be received Mar. 23 by the Bd. of Pub. Wks. (L. E. Davy, Pres.), for furnishing material and constructing water works, as advertised in The Engineering Record.

Thief River Falls, Minn.—The citizens are reported to have voted to issue $28,000 bonds for water works and a sewerage system.

Vicksburg, Miss.—Harry K. Johnson is reported to have withdrawn his application to City Council for a franchise for water works and a sewerage system.

Aberdeen, Miss.—See "Power Plants, Gas and Electricity."

Aberdeen, Miss.—The citizens are reported to have voted to issue $70,000 for water works and a sewerage system.

Houston, Miss.—See "Power Plants, Gas and Electricity."

**Indianola, Miss.*—The Town Council is reported to have awarded to W. C. Porter, of Laurel, Miss., the contract to lay 10,000 additional ft. of water mains for the town, together with the requisite amount of fire hydrants.

St. Louis, Mo.—The House of Delegates has passed a bill appropriating $600,000 for the construction of a 7-ft. steel flow line from Chain of Rocks to Baden pumping station; also $160,000 for extensions of water mains into territory not now reached by the Water Dept.

Oronogo, Mo.—F. F. Mumma, City Clk., writes that it was voted Feb. 28 to issue $10,000 bonds for constructing water works.

Alma, Neb.—See "Power Plants, Gas and Electricity."

Falls City, Neb.—The city is reported to be considering the question of securing an additional water supply.

Albany, N. Y.—The Governor has signed the bill authorizing the city to issue $400,000 bonds for the purpose of enlarging the filtration plant.

Medina, N. Y.—The lowest bid opened on Mar. 1 for the construction of water works is stated to have been submitted by the Rensselaer Constr. Co. for $85,000.

**Rochester, N. Y.*—The Rensselaer Mfg. Co., of Troy, is reported to have secured the contract for stop valves for the Cobbs Hill reservoir and for water main extensions for $13,653.

Oswego, N. Y.—The Common Council has approved the enabling act passed by the State Assembly and Senate, granting the city permission to issue $200,000 bonds for the construction of a lake water system.

Buffalo, N. Y.—The National Bd. of Fire Underwriters is stated to have submitted to Mayor Knight a report on the fire and water conditions of Buffalo. The following are among the improvements recommended: Complete arrangements at once for putting into commission 5 new boilers now set and pushing the work of getting 5 additional ones, and thus bring the capacity up to at least 250,000,000 gal.; the erection of a reserve pumping station independent and removed from the present one, to have a capacity of 250,000,000 gal., and separate pumping machinery for the Washington and Pearl Sts. pipe lines to be installed in a fireproof building.

Albany, N. Y.—Governor Higgins has signed the bill granting permission to Albany to borrow $400,000 for an extension of the water works.

Oakes, N. D.—Bids will be received for laying water mains and sewers, in said city. For further information apply to W. S. Wickersham, City Aud.

Toledo, O.—Bonds to the amount of $500,000 were sold on Mar. 1 by the Council Com. on Finance to be used for the construction of a filtration plant.

Dayton, O.—Bids are wanted Apr. 1 for $500,000 water works bonds. Edw. Philipps, City Aud.

Jackson, O.—The citizens are reported to have voted to issue $60,000 bonds for water works.

East Liverpool, O.—The Council is reported to have under consideration the question of issuing $150,000 bonds for a filtration plant, enlarging the pumping facilities and improving the fire service.

Toledo, O.—The Bd. of Pub. Service is stated to have decided to construct a concrete conduit from the proposed new water works filtration plant to the water works pump station on Bway.

Local press reports state that about 4 miles of water mains will be laid this summer.

Delta, O.—Riggs & Sherman, of Toledo, are stated to have completed plans for water works for Delta. The question will soon be submitted to a vote.

North Amherst, O.—The Town Council is reported to have decided to select Chapin & Knowles, Frick Bldg., Pittsburg, Pa., to prepare estimates for water works.

Cleveland, O.—Bids will be received by A. R. Callow, Secy. Bd. Pub. Service, on Mar. 21, for furnishing f. o. b. cars Cleveland 4 and 6-in. fire hydrants, as may be required by the Water Wks. Dept. during 1905; also on same date for water valves from 4 to 48-in., inclusive, for the year 1905, both advertised in The Engineering Record.

Tillamook, Ore.—Wm. B. Chase, Consulting Engr., 661 Worcester Bldg., Portland, writes that the date of opening of bids for the construction of water works for Tillamook has been extended from Feb. 23 to Mar. 15. This work will consist of a distribution system about 3 miles in length and a main line 5.8 miles long. The cost will be about $42,000.

**Allegheny, Pa.*—The Dept. of Pub. Wks. is stated to have on Feb. 28 awarded to the U. S. Cast Iron Pipe & Fdry. Co., Pittsburg, contract for water pipe at $23.70 to $27.70 per ton, and specials, 2¾ cts. per lb.

Clear Lake, S. D.—The City Council is reported to be considering the construction of water works.

Marion, S. D.—See "Power Plants, Gas and Electricity."

Avon, S. D.—The question of constructing water works is reported under consideration here.

Parkston, S. D.—F. D. Simmons, City Clk., writes that it was voted Mar. 1 to issue $20,000 bonds for the construction of water works.

Denison, Tex.—J. T. Shaunessey, of Chicago, Ill., is reported to have submitted to City Council a proposition to install new water works at Denison.

North Ft. Worth, Tex.—Press reports state the City Council has accepted plans for the proposed water works.

Salt Lake City, Utah.—Geo. W. Riter, City Engr., writes that this city has sold water bonds to the amount of $850,000, the proceeds to be used in acquiring rights to water in Big Cottonwood Creek and other mountain streams, and in constructing a conduit about 7 miles in length to deliver water to city. Plans are now being prepared for a reinforced concrete-steel conduit of circular cross-section, 4½ ft. in diam. On certain portions of the line, riveted steel pipe will be substituted for reinforced concrete. The plans also include a diverting dam at inlet of conduit, and an electric generating plant to be located at outlet of conduit, and to have about 300 kw. electrical output.

Seattle, Wash.—M. D. Kelly, P. O. Box 384 109 Marion Ave., Seattle, writes that he would like information in regard to the best and latest improved machinery required in connection with the following work. It is proposed to take water from Columbia River to irrigate 8,000 acres of land by gravitation, and to furnish power to operate a plant, to generate electrical power to manufacture lumber and flour; also power for electric roads and pumping plants for irrigation of 3 tracts of agricultural lands.

Ft. Casey, Wash.—Bids are want
24 for constructing boiler and pum
pumping machinery, tank trestle.
wells, water mains, etc., at this post
dress Geo. H. Penrose, Q. M., U. S. A
Townsend.

Milwaukee, Wis.—Bids will be r
Mar. 14 by the Bd. Pub. Wks. for fur
Water Department f. o. b. cars, 75
drants of the "Single Valve Matth
"Improved Stowell" pattern, each
with a single combination 4-in. stea
2½-in. hose nozzle; said hydrants to
in diameter, 7 ft. long, measured fr
walk grade to bottom of pipe; also f
nishing material and laying 4, 6, 8,
16-in. water pipe in certain streets
year 1905; also for hauling and de
water pipe, hydrants and special cast
may be required by water departments
year 1905. Chas. J. Poetsch, Chmn.

**Menasha, Wis.*—Contracts for ma
be used in water works constructio
opened Feb. 23), are stated to hav
awarded as follows: Gould Co., New
N. Y., two No. 3 single acting triplex.
trimmed, vertical power pumps, for
Ludlow Hydrant Co., Chicago, Il
valves and connections, $2,665; U. S
Iron Pipe & Fdy. Co., Chicago, Ill., c
pipe at $27.35 per ton and special cast
2½ cts. per lb.; American Deisel Eng.
New York, N. Y., 2 engines; John Da
Chicago, Ill., wrought iron pipe and
and to the Raymer Lead Co., Chica
pig lead and jute; total cost about $75
The City Council Com. (Aug. H
Mayor, Chmn.) is reported to have au
the engineer to prepare plans for a to
cost about $7,000.

Cody, Wyo.—G. W. Zorn, Ch. En
Horn Basin Development Co., writes t
will be opened Apr. 3 for construct
first 16 miles of canal from the S
River. Contracts for more canal w
for about 7,500 ft. of tunnel work will
later on.

Fernie, B. C.—J. A. Rennie, Cit
writes that it is proposed to construc
works and a sewerage system, but
definite has yet been done.

Portage la Prairie, Man.—Bids will
ceived until Apr. 12 by F. A. Whitaker
Treas., for the following proposed work
laying for water works and sewerage
power house, water tower, pumping ma
and boilers. Willis Chipman, Con
Engr., Toronto, Ont.

Juarez, Mexico.—Press reports sta
bids are about to be called for to be su
to Governor Creel, of Chihuahua, for t
struction of water works and a sewer
tem for the city of Juarez, to cost abo
000. The State of Chihuahua is repo
have made the appropriation for th
Mr. Montemayoris, Mayor of Juarez.

Ottawa, Ont.—Press reports state t
Water Works Com. will expend about
this year for improvements in con
with extending the water service a
creasing the pressure.

Montreal, Que.—Geo. Janin, Supt.
Dept., has submitted a report to the
Com. on increasing the water supply
city. He estimates the cost of the w
follows: Lateral conduit with a di
of 50,000,000 gals. daily, $660,000;
tions, stop gates, etc., $817,000; whee
new pumping machinery, etc., $300,0
tending the conduit out into the St
rence by means of two pipes, $75,000;
ing and deepening of tailrace, $45,00
tion wells for pumps, $20,000; purc
land, $20,000; extra cost for steam
during the construction of the new
$95,000; yearly interest charge, $
making a grand total of $2,217,280.

Montreal, Que.—Bids will be received
Montreal Water & Power Co. until
for a 15,000,000 gal. high duty pump
gine, with boilers, etc., complete, as adv
in The Engineering Record.

SEWERAGE AND SEWAGE POSAL.

Notes Arranged Alphabetically by St

Redding, Cal.—The citizens will p
soon be asked to vote on issuing $60,00
for the construction of a sewerage
$50,000 for the improvement of stre
$15,000 for improvement of approaches
city.

Denver, Colo.—A new sewer distr
been proposed by the Bd. of Pub. Wks.
north side, to be known as Highland
Sanitary Dist. No. 7; cost of const
$66,000.

Washington, D. C.—A. E. Phillips,
Supt. of Sewers, writes that the fo
are the bids opened on Mar. 6 for co
ing 2 siphons for sewage disposal
across Anacostia River: *a*, 3,000 c
excav. below bed of Anacostia River,
yd.; *b*, 2,400 lin. ft. 60-in. diam. c
per lin. ft.; *c*, totals. Hiram W.
a, 65 cts.; *b*, $16.52; *c*, $41,598.
Louchheim, *a*, 80 cts.; *b*, $17.90; *c*,

Daytona, Fla.—J. W. Wilkinson, Ci
writes that plans have not yet been su
for the construction of the sewerage sy

Augusta, Ga.—Bids will be receive
20 by Nisbet Wingfield, Comr. of Pub
for furnishing material and constru
pipe sewers which may be ordered
City Council during year 1905.

Cairo, Ill.—The City Council is rep
have under consideration the constru
a main outlet sewer. Mr. Winter, May

Items marked thus give the names of parties awarded contracts.

na, Ill.—J. E. Daley, of Jacksonville, eported to have secured the contract ructing sewers (bids opened Feb. 15))89. The work consists of 1,616 ft. ick sewer, of which 800 ft. is tunnel 95 ft. 24x36-in. brick sewer and 400 ewer.

go, Ill.—Judge Carter is reported to nfirmed an assessment of $745,000 for truction of a sewage pumping station St. and Erie Ave. A system of sewers South Chicago, Burnside, Dauphin uclid Park, Stony Island and Irondale provided for in the assessment.

sh, Ind.—It is stated that bids will ved until Mar. 13 for building a sani- wer in Main St. Freemont McLees, t.

nsport, Ind.—Local press reports state ds will be received on Apr. 5 for a ge system for the west side, about 3 n length. W. A. Osmer, City Engr.

napolis, Ind.—Plans for the Senate wer, prepared by City Engr. B. J. T. re stated to have been accepted by the Wks., and bids will be called for at The bidders will be asked to submit on both concrete and brick construc- The sewer will cover a territory of miles and will cost about $50,000.

o, Ia.—It is stated that bids will be d until Mar. 20 by the Sewerage Com. Richards, Chmn.), for constructing an vitrified pipe sewer about 2,800 ft.

lesha, Kan.—Bids are wanted Mar. 29 rnishing material and constructing a ge system about 5 miles in length, as ised in The Engineering Record.

Leavenworth, Kan.—Bids will be re- by Maj. D, E. McCarthy, Q. M., U. on Apr. 3 for installing a sewage lift Leavenworth, as advertised in The En- ing Record.

port, Ky.—The General Council is re- to have under consideration the con- ion of a number of sewers throughout ty during the coming summer.

m, Mass.—Bids will be received by the age Comrs. (Jos. N. Peterson, Chmn.) r. 31 for the construction of c. i. force and Sect. No. 1 North River tunnel ; also on same date of constructing ry portion of Sections 4 and 5 North trunk sewer. with brick or reinforced ete masonry, both advertised in The En- ing Record.

luth, Minn.—City Engr. McGilvray is re- d to have completed plans for sewers 65th Ave. E. to 67th Ave. W.

ief River Falls, Minn.—See "Water."

anite Falls, Minn.—Bids are wanted 24 for constructing a sewer in a por- of Hill St. H. P. Bengtsen, City Re- r.

. Paul, Minn.—Bids will be received 16 by the Bd. Pub. Wks. for construct- ewers in portions of Carroll St., Summit, , Lincoln and Grand Aves. R. L. Gor- Clk.

erdeen, Miss.—See "Water."

cksburg, Miss.—See "Water."

erdeen, Miss.—See "Power Plants, Gas Electricity."

Joseph, Mo.—Bids will be received until 5 by the Bd. Pub. Wks., for furnishing rial and constructing South St. Joseph, more St., Mitchell Ave., Grand Ave. and t Park extension sewers, as advertised he Engineering Record.

wark, N. J.—Plans are being prepared dw. S. Rankin for a sewer system to be tructed in that part of the city north loomfield Ave. and west of N. 6th St. e alternative plans have been drafted, of two of which call for an expenditure pproximately $50,000.

bury Park, N. J.—Plans have been sub- d to the State Sewage Comn. for ap- l for a septic tank disposal plant for ry Park. Mr. Coffin, Supt. Sewer Dept. bury Park.

boken, N. J.—Bids will be received Mar. the Mayor and Council for constructing ver in a portion of 1st St. Jas. H. Lon- n, City Clk.

Wood, N. Y. H., N. Y.—Bids will be re- l by Capt. Traber Norman, Q. M., U. S. Governors' Island, Apr 7, for the con- tion of a sewerage system at Ft. Wood, e's Island, N. Y. H., as advertised in Engineering Record.

o York, N. Y.—Bids will be received 21 by Louis F. Haffen, Pres. Boro. , for constructing temporary sewers appurtenances in portions of Locust . and S. Oak Drives and Hickory Ave.; for constructing sewers and appur- ces in portions of several other streets. gineer's estimate: 6,510 lin. ft. 12, 15 18-in. pipe sewer, 6,415 cu. yds. rock excavated and removed, etc.

enville, N. C.—The State Senate is l to have passed a bill authorizing this to issue $10,000 bonds for a sewerage n.

ces, N. D.—See "Water."

iddletown, O.—The following are re- l to be the bids opened by the Bd. of Service on Feb. 21 for constructing the e Road sewer: John H. Francisco, Day- 5,348 (awarded contract); John Arpp, 3, and R. J. Paul, Dayton, $6,380.

Warren, O.—E. M. Milligan, City Engr., is stated to have completed his map, showing route and connections of Freeman St. sewer, to be constructed this summer, at a cost of $8,000.

Fremont, O.—The Council is reported to have passed an ordinance providing for an issue of $24,929 sewer bonds.

Cincinnati, O.—Bids will be received Mar. 29 by the Bd. Pub. Service for furnishing material and constructing sewers in portions of Linwood, Eastern, Beechmont Aves. and Griest St. Geo. F. Holmes, Clk.

Alliance, O.—Bids will be received Mar. 15 by the Bd. Pub. Service for constructing a 2-ring 48-in. brick storm sewer in several streets. C. E. Harsh, Clk.

Portsmouth, O.—It is stated that bids will be received until Mar. 29 by Filmore Musser, Clk. Bd. Pub. Service, for constructing a flood defense sewer, to cost, including pumping station, about $7,000. Benj. Brat, City Engr.

Williamsport, Pa.—Bids will be received Mar. 15 by the Grafins Run Com. of Councils for constructing a sewer in a portion of Locust St. and outlet retaining walls of Grafins Run sewer in Hepburn St.; also for constructing an inlet in High St., as advertised in The Engineering Record.

Media, Pa.—The Boro. Council is reported to have under consideration the construction of a sewage disposal plant, at a cost of $50,000.

**Wilkesbarre, Pa.*—Contracts for constructing pipe sewers on 47 streets (bids opened Feb. 24) will probably be awarded according to divisions as follows: Div. No. 1, to Grossart, Pascoe & Co., Allentown, Pa., $23,166; Div. No. 2, to D. M. Rosser, Kingston, Pa., $12,903; Div. No. 3, to Haurnan Bros., Reading, Pa., $11,639; Div. No. 4, to D. M. Rosser, Kingston, Pa., $13,963; Div. No. 5, to Haurnan Bros., Reading, Pa., $13,847, and Div. No. 6, to D. M. Rosser, Kingston, Pa., $14,337.

Scranton, Pa.—Mayor Connell is reported to have signed the ordinance providing for the building of Section A of the 18th Sewer Dist., in the 20th Ward; it is estimated to cost $134,260, of which part the city will pay $26,000, and the abutting property owners along the sewer the balance.

Salt Lake City, Utah.—E. W. Riter, City Engr., writes that plans are being prepared for an intercepting sewer to take care of the sewage in the lower district of the city; it will be about 3 miles in length and the sewage will be pumped from its outlet into the main gravity outlet sewer. Bonds to the amount of $150,000 have been sold for this work.

North Yakima, Wash.—Ernest McCulloh, City Engr., writes that bids will be received until Mar. 20 for the construction of a sewerage system. There will be required for this work approximately the following: 975 lin. ft. 16-in. and 2,780 lin. ft. 18-in. wood stave pipe; 400 lin. ft. 20-in., 1,725 ft. 18-in., 6.935 ft. 15-in., 7,910 ft. 12-in., and 5,275 ft. 10-in vitr. pipe sewer; 31,460 lin. ft. 6-in. tile sub-drain; 2 screen chambers; 2 weir chambers and 58 manholes.

**Seattle, Wash.*—T. Ryan is stated to have secured the contract for constructing a sewer on 10th Ave., N. E., and other streets, for $8.893.

The City Council has passed ordinances providing for the construction of a sewer on 25th Ave., to cost $8,000, and concrete sidewalks on E. Columbia St.; cost, $10,000.

Wheeling, W. Va.—Separate bids will be received Mar. 15 by the Bd. Pub. Wks. for furnishing sewer pipe, paving brick, stone and concrete curbing during year 1905: also for dressing and resetting old curb. Thos. McGranahan, Clk.

Milwaukee, Wis.—The annual recommendation of the Bd. of Pub. Wks. for the extension of the sewerage system has been submitted to Common Council. The Bd. intends to build a large number of sewers, and the amount of money needed has been given at $211,592. Of this amount $27,160 is to be expended for the east side, $114,483 for the west side, and $79,949 for the south side sewerage district.

Watertown, Wis.—It is stated that bids will be received until Mar. 18 by the Bd. Pub. Wks., for constructing 2,810 ft. 10 to 18-in. pipe sewers and 26 catch basins. E. B. Parsons, City Engr.

Fernie, B. C.—See "Water."

Portage la Prairie, Man.—See "Power Plants, Gas and Electricity."

Juarez, Mexico.—See "Water."

Brantford, Ont.—See "Paving and Roadmaking."

BRIDGES.

Notes Arranged Alphabetically by States.

Richland, Ark.—It is stated that bids will be received until May 1 by Geo. Wufing, of Richland Center, for building a steel bridge across Wisconsin River at Tone Rock.

Moscow, Idaho.—It is stated that bids will be received until Apr. 19 by the Co. Comrs. for constructing a bridge across Bear Creek and one across Paradise Creek. Axel P. Ramstedt, Clk.

Cedar Rapids, Ia.—Local press reports state that bids will be received on Mar. 24, by the Public Improv. Com. (Mr. Cherry, Chmn.), for erecting a steel-concrete bridge on 2d Ave.

Newton, Kan.—It is stated that bids will be received until Mar. 20 by the Co. Clk., for constructing 2 bridges across Mud Creek in Macon Township.

Pontiac, Mich.—Bonds amounting to $16,000 are reported sold; $13,000 to be used for reconstructing 7 wooden bridges, and $3,000 for constructing sewers.

**Bayonne, N. J.*—The following bids are stated to have been received for the construction of a bridge over the Central R. R. tracks on the Boulevard: Joseph Cutley, $15,238; Jas. Billington, $12,083; United States and Venezuela Asphalt Co., $9,178, and the Uvalde Asphalt Paving Co., of Jersey City, $9,091 (awarded contract).

East Orange, N. J.—The City Council is stated to have adopted a resolution requesting the Bd. of Freeholders to repair the Central Ave. Bridge.

Jersey City, N. J.—See "Paving and Roadmaking."

Binghamton, N. Y.—See "Railroads."

New York, N. Y.—The following are the bids opened on Mar. 2 by Geo. E. Best, Comr. of Bridges, for constructing lattice railings on the footwalks of the Williamsburg Bridge over East River: Chas. Mead & Co., $20,430; Louis Wechsler, $20,445; North Eastern Constr. Co., $20,919; Snare & Triest Co., $24,950; Empire Constr. & Supply Co., $20,500; W. D. Bailey, $18,350; Burney & Godfrey, $21,272; T. C. O'Donnell, $24,500 and Eagle Iron Works, $20,974.

Watertown, N. Y.—The construction of a railway bridge over the river connecting Main and Moulton and Davidson Sts. is reported under consideration.

Elizabeth City, N. C.—It is stated that the General Assembly has passed a bill authorizing the Camden Ferry Co. to construct a drawbridge over Pasquotauk River here.

Langdon, N. Dak.—Bids will be received Apr. 5 by the Bd. Co. Comrs., for furnishing material and constructing a steel or combination bridge over Pembina River, said bridge to be 100-ft. span, 20-ft. roadway, and 16-ft. high, with tubular steel foundation, and pile approaches 15-ft. wide, at each end of bridge. Robt. Work, Co. Aud.

Dayton, O.—Bids are wanted Apr. 1 for $120,000 Washington St. and $37,000 Herman Ave. bridge bonds. Edw. Philipps, City Aud.

Columbus, O.—Bids will be received until Mar. 30 by the Co. Comrs at Columbus, for furnishing material and constructing the substructure and superstructure of several bridges throughout the county, and also for constructing approaches to several bridges. Blueprints may be obtained from the County Engineer for $1 each for the substructure, superstructure and approaches. L. E. Jones, Co. Aud.

Bloomsburg, Pa.—It is stated that bids will be received until Mar. 23 by J. H. Shumaker, Supt. Pub. Grounds & Bldgs., at Harrisburg, for rebuilding the substructure and superstructure of a bridge across Catawissa Creek, Columbia County.

Wilkesbarre, Pa.—Bids will be received until Mar. 23 by J. M. Shumaker, Supt. Pub. Grounds & Bldgs., at Harrisburg, for the rebuilding of the substructure and superstructure of the bridge across Nescopeck Creek, Nescopeck Township, Luzerne Co.

**Galeton, Pa.*—The Warsaw, Wilkinson Co., of Warsaw, N. Y., is stated to have received the contract for constructing an iron bridge here, for $7,500.

Penn, Pa.—It is stated that the County Comrs.. at Lancaster, will soon let the contract for constructing a bridge 120 ft. long over the Tulpehocken River, between Penn and North Heidelberg, at a probable cost of $5,000 .

Lewistown, Pa.—See "Railroads."

Providence, R. I.—The date of opening of bids for building a draw span and for approaches to the Rhode Island stone bridge has been extended from Mar. 22 to Mar. 30, as advertised in The Engineering Record.

Greenville, S. C.—It is stated that bids are wanted until Mar. 22 by the Bd. of Superv., for building approaches to Bennett's and the new bridge on Enoree River, near Batesville.

Alexandria, S. D.—Bids will be received Mar. 22 by the Bd. Co. Comrs., at Alexandria, for constructing a steel bridge, 122 ft. span, over James River between Hanson and Hutchinson Counties; also for furnishing material and constructing all steel bridges that may be ordered by the Co. Comrs. during year 1905. C. E. Twamley, Co. Aud.

**Ft. Stockton, Tex.*—The Texas Bridge Co., of Dallas, is stated to have received the contract for constructing an iron bridge over Pecos River here, for $5,850.

Sutton, Va.—It is stated that a bridge will be constructed over the James River to connect Buckingham and Nelson Counties.

Aberdeen, Wash.—The Pacific Constr. Co., of Portland, Ore., is stated to have received the contract for constructing a bridge over Chehalis River here, for about $50,000.

Turtle Lake, Wis.—Bids will be received Mar 15 by the Town Bd. (C. Kulowatz, Chmn.), for constructing 3 stone piers for steel bridge over Turtle Creek.

Welland, Ont.—Bids will be received until Mar. 28 by Robt. Cooper, Co. Clk., at Welland, for constructing a bridge across Welland River, to be known as Robin's Bridge, about 2 miles from Perry Station. The substructure is to be of concrete 12 ft. 3 in. above low water mark, and the superstructure of steel, 100 ft. in length and 16 ft. wide. Bids on superstructure and substructure may be submitted separately.

PAVING AND ROADMAKING.

Notes Arranged Alphabetically by States.

Montgomery, Ala.—Bids will be received Apr. 3 by R. S. Williams, City Treas., for paving sidewalks with Schillinger or Hexagon block on portions of Virginia and Jefferson Davis Aves., and Jefferson St.

Sacramento, Cal.—The Senate is stated to have passed a bill providing for an appropriation of $25,000 to construct a highway from Gen. Grant's Park to King's River Canyon.

**San Francisco, Cal.*—The Bd. of Wks. is stated to have awarded the contract for paving with asphalt on a portion of H St. to the City Street Improvement Co., 10 Mills Bldg., for $27,990.

Redding, Cal.—See "Sewerage and Sewage Disposal."

**Sharon, Conn.*—Jas. B. Wilbur, 1st Selectman, writes that the contract for graveling a section of road, 5,835 ft., has been awarded to Geo. E. Bierce, of Sharon, at 68 cts. per lin. ft.

**Hartford, Conn.*—Edwin D. Graves, Ch. Engr., Connecticut River Bridge & Highway Dist. Comn., writes that Richards & Gaston, 143 Liberty St., New York, N. Y., have secured the contract for furnishing material and grading railroad tracks, streets and approaches, involving approximately 325,000 cu. yds., for about $92,000.

Augusta, Ga.—Bids will be received Mar. 20 by Nisbet Wingfield, Comr. Pub. Wks., for furnishing material and setting all curbing which may be ordered by City Council during year 1905.

Parkridge, Ill.—It is stated that bids will be received until May 1 by the Village Trus. for constructing cement sidewalks and street crossings.

Chicago, Ill.—The Bd. of Local Improvements is stated to have authorized the expenditure of $400,000 for paving. The improving of portions of the following streets included: With asphalt, N. Marshfield Ave., $29,500; W. 22d St., $64,000; W. 62d St., $34,000; Union Ave., $24,000; 35th St., $26,500; S. Hamilton Ave., $14,000; Waller St., $16,500, and with brick, W. 64th St., $15,000.

Ft. Wayne, Ind.—F. M. Randall, City Engr., writes that bids will be received by the Bd. of Pub. Works Mar. 23 for paving about 63,000 sq. yd. with vitrified shale block and sheet asphalt; probable cost, $135,000.

Indianapolis, Ind.—It is stated that the Bd. of Pub. Wks. will soon receive bids for laying cement curbs and gutters, cement sidewalks and grading and graveling portions of numerous streets.

Terre Haute, Ind.—It is stated that bids will be received Mar. 15 for paving E. Main St. N. S. Kidder, City Engr.

Brookville, Ind.—It is stated that bids will be received Mar. 20 for grading and graveling 11th and Franklin Sts. Jos. Daçev, City Clk.

**Des Moines, Ia.*—O. P. Herrick, 126 W. Locust St., has secured the contract for paving about 3,954 sq. yd. on 2d and School Sts. (bids opened Feb. 28) at $1.57⅞ per sq. yd. One course of No. 1 repressed vitr. brick will be laid on a 6-in. natural cement concrete foundation with Portland cement filler.

Cedar Rapids, Ia.—The Council is reported to have adopted a resolution providing for the paving of 2d St., "A" Ave. and two portions of "B" Ave. with repressed block brick.

Ft. Leavenworth, Kan.—Bids are wanted Mar. 23 for furnishing and delivering brick, cement and sand for constructing curbs and gutters at this post. Address Maj. D. E. McCarthy, Q. M.

New Orleans, La.—The City Council is stated to have passed an ordinance providing for the repaving of Tulane Ave.

Westfield, Mass.—This town is reported to be considering the purchase of a crushing plant and road roller. Geo. W. Roraback, Supt. of Sts.

Detroit, Mich.—Bids will be received Mar. 31 by the Dept. Pub. Wks. for furnishing all shale or fire clay that may be required by city for making brick for paving purposes during year ending Dec. 31, 1905. Wm. H. Maybury, Comr.

Mankato, Minn.—The Council has ordered about 30,000 yds. of brick paving on two streets. J. R. Thompson, City Engr.

Brookhaven, Miss.—R. D. Lanier, Mayor, writes that it is proposed to pave 4 blocks with brick, at a cost of about $4,000.

St. Louis, Mo.—Local press reports state that bids will be received Mar. 21 by the Bd. Pub. Improv., for improving with asphalt portions of numerous streets: also on same date for reconstructing with brick a portion of 13th St.

Independence, Mo.—It is stated that bids will be received until Mar. 22 for paving about 2,000 sq. yds. on E. Pacific St. with vitrified brick. H. H. Pendleton, City Engr.

Items marked thus give the names of parties awarded contracts.

Concord, N. H.—Arthur W. Dean, of Nashua, has been appointed State Highway Engr., and he, with the Governor and Council, will have charge of State highway work for which the Legislature recently passed the bill appropriating $125,000 annually.

**Wildwood, N. J.*—J. DuBois, Boro. Clk., writes that the contract for 125,000 sq. ft. of walk, and 25,000 lin. ft. of curb (bids opened Feb. 14) has been awarded to Rudolph S. Blome Co., Unity Bldg., Chicago, Ill., for $21,090. For list of bids received for this work, see issue of The Engineering Record Feb. 25.

Jersey City, N. J.—At a meeting of the joint Plank Road Com. of Essex and Hudson Counties, held at the office of the Hudson Freeholders, a resolution is stated to have been passed authorizing engineers of both counties to prepare plans for the completion of the Plank Road, to include the reconstruction of the bridge over Passaic River; the probable cost of the proposed improvement is $1,000,000, the bridge to cost about $300,000.

Camden, N. J.—Bids are wanted Mar. 16 for macadam driveways and gravel walks in new park, requiring about 3,500 yds. macadam and 1,500 cu. yds. gravel. L. E. Farnham, City Engr.

South Orange, N. J.—Bids will be received by the Bd. of Village Trus., on Mar. 20 for paving Prospect Pl., Charlton Ave., Kingman Road and Hamilton Road with Telford broken stone, as advertised in The Engineering Record.

**Atlantic City, N. J.*—The Cleveland Trinidad Paving Co., Rose Bldg., Cleveland, O., is stated to have received the contract for paving with asphalt on Atlantic Ave., for $216,000.

Cleveland, O.—The following are reported to have been the lowest bids received by the Bd. of Pub. Service on Feb. 26; for constructing stone sidewalks, Cleveland Stone Co., Hickox Bldg., at $18,613, and for constructing cement sidewalks, Leek & McGrath, at $10,305.

City Engr. Carter is stated to have prepared plans for a combined bridge and roadway through the flats connecting Clark and E. Clark Aves.; estimated cost of proposed improvement is $1,000,000.

**Middletown, O.*—The following are reported to be the bids opened on Feb. 21 by the Bd. of Pub. Service for the cement work on the Woodlawn Ave. street improvement; Couch & Kunkle, Dayton, $8,880; John Goff, $7,551; John Arpp, Jr., $7,737; E. Dietrich, $8,636; J. C. Everroad, Columbus, Ind., $8,567; F. M. Kemp & Sons, $7,124 (awarded contract); C. Williams, Connersville, Ind., $7,704.

Bucyrus, O.—The City Council is stated to have authorized the Bd. of Pub. Service to receive bids for improving Sandusky Ave., at a probable cost of $18,200.

Lima, O.—Bids will be received until Mar. 29 by O. J. Rose, Clk. Bd. Pub. Service, for furnishing material and paving with sheet asphalt on a portion of McDonel St. requiring approximately 13,500 sq. yds. asphalt on a 6-in concrete foundation, 5,800 lin. ft. combined cement curb and gutter together with excavation, etc. R. H. Gamble, Ch. Engr.

Norwood, O.—Bids wil be received April 1 by the Bd. Pub. Service for furnishing material and improving Lloyd Ave., by grading, curbing, graveling and macadamizing roadway; also for constructing necessary culverts and drains. J. A. Stewart, City Engr., Rm. 813, Traction Bldg., Cincinnati. E. B. Edwards, Clk.

New York, N. Y.—The following are the bids opened by Louis F. Haffen, Pres. Bronx Boro., on Feb. 21 for wood block paving; (*a*) Franklin Contr. Co., 1 Hudson St.; (*b*) U. S. Wood Preserving Co., 29 Bway; (*c*) Eppinger & Russell Co., 68 Broad St.; (*d*) Cunningham & Kearns Contr. Co., 438 E. 91st St.; (*e*) Republic General Contr. Co., 1181 Bway; (*f*) Abbott-Gamble Co., 32 Bway:

Boston Road, from Prospect Ave. to Southern Boulevard.

	a.	*b.*	*c.*	*d.*	*e.*
20,200 sq. yd. wood block	$2.30	$2.24	$2.46	$2.40	$2.64
2,850 cu. yd. concrete	6.25	5.25	6.50	4.90	.01
3,000 lin. ft. new curb	1.00	.95	1.00	.95	1.00
2,500 " old curb	.40	.35	.50	.30	.40
Total	$68,272	$63,935	$72,467	$66,045	$57,356

E. 144th St., from Third Ave. to Rider Ave.

	e.	*a.*	*c.*	*b.*	*d.*	*f.*
3,550 sq. yd. wood block	$2.60	$2.30	$2.34	$2.10	$2.19	$2.31
570 cu. yd. concrete	.01	6.25	6.50	5.00	4.50	5.85
2,150 lin. ft. new curb	1.00	1.00	1.00	.90	.90	.95
Total	$11,528	$13,877	$14,162	$12,240	$12,274	$13,577

E. 150th St., from Courtlandt Ave. to Park Ave.

	c.	*b.*	*e.*	*a.*	*d.*	*f.*
3,975 sq. yd. wood block	$2.34	$2.10	$2.64	$2.30	$2.19	$2.31
665 cu. yd. concrete	6.50	5.00	.01	6.25	4.50	5.85
3,000 lin. ft. new curb	1.00	.90	1.00	1.00	.90	.95
Total	$16,624	$14,372	$13,501	$16,299	$14,398	$15,922

New York, N. Y.—Bids will be received Mar. 21 by Louis F. Haffen, Pres. Boro. Bronx, for paving with asphalt blocks on concrete foundation a portion of E. 183d St. and with granite blocks on concrete foundation from Park to Webster Aves.; also for regulating, grading, curbing and flagging sidewalks on E. 206th St.; engineer's estimate, 3,700 sq. yds. completed asphalt block pavement, and keeping same in repair for 5 years, 1,200 lin. ft. new curb., furnished and set, 825 sq. yds. completed granite block pavement, with paving cement joints, and keeping same in repair for 5 years, 4,950 cu. yds. earth excav., 5,400 cu. yds. rock excav., 1,700 cu. yds. fill, 1,200 lin. ft. new curb., furnished and set, 4,650 sq. ft. new flag., furnished and set, etc.

Syracuse, N. Y.—The Bd. of Contract & Supply is stated to have rejected all bids received Feb. 20, for paving Marshall St. F. J. Baker is reported to have submitted the lowest bid at about $8,970.

North Greece, N. Y.—Bids will be received Mar. 17 by the Town Bd., for furnishing, crushing and placing 5,235 yds. crushed stone or Charlotte foundry slag and 1,500 yds. screenings on portion of Clinton Ave. or Denise Road, Sage or McGuire Road, Big Ridge Road, N. Greece Road, and Greece Center Road. Chas. E. Toal, Town Clk.

Geneva, N. Y.—The McGrewy Constr. Co., of Ithaca, submitted the lowest bid on Feb. 23 for paving E. North and Castle Sts., 19,600 sq. yd., with Metropolitan block, at $1.98 per sq. yd.; John R. Baxter, Jr., of Utica, submitted the lowest bid for same streets on Mack block at $2.02 per sq. yd.; and Thos. Fitzgerald, Jr., of Fredonia, submitted the lowest bid on Clearfield block at $1.94 per sq. yd.

**Rochester, N. Y.*—H. N. Cowles, 47 Tacoma St., is stated to have received the contract for paving with brick 1st St. for $26,043.

Brooklyn, N. Y.—The Flatbush Local Bd. is stated to have voted to spend $120,000 for paving with asphalt on a concrete foundation, Bedford Ave., from Eastern Parkway to Flatbush Ave.

Albany, N. Y.—The Senate is stated to have passed the bill providing for a bond issue of $50,000,000 for improving highways.

Cincinnati, O.—The Bd. of Pub. Service is stated to have adopted the resolution providing for the paving with bitulithic paving on a portion of Linwood Ave., at a cost of $176,507

Bids will be received Mar. 27 by the Bd. Pub. Service, for furnishing material and repairing numerous asphalt street. Bids will also be received Mar. 29 for grading, curbing and paving with brick a portion of Oak Ave. Geo. F. Holmes, Clk.

Lancaster, Pa.—Bids will be received at the office of the State Highway Dept., Harrisburg, on Mar. 24 for the construction of roads in Earle, Rapho and Penn Townships, in Lancaster County, in all about 10,940 ft.

The following are the lowest bids opened on Feb. 14 by the State Highway Dept. at Harrisburg for highway construction in Lancaster County: East Drumore Township, 25,200 lin. ft., Berghous & Moffit, of Harrisburg, $68,813; Providence Township, 5,280 lin. ft., John L. Hanna, Jr., Franklin, Pa., $7.629.

York, Pa.—The lowest bid opened on Feb. 24 by the State Highway Dept. at Harrisburg for constructing 7,085 ft. road in Spring Garden Township, was submitted by John H. Dobbling, of York, Pa., for $7,745.

**Meadville, Pa.*—John Swan, Jr., of Allegheny, has secured the contract for paving Park Ave with brick (bids opened Feb. 15) for $28,435.

Spring City, Pa.—It is stated that Main St. will be paved with vitrified brick, at a cost of $15,000.

Wilkesbarre, Pa.—All bids opened on Feb. 27 for removing several miles of cobble stone pavement and curbing and repaving said streets with vitrified fire clay paving block have been rejected, and new bids will be called for. Fred. H. Gates, City Clk.

Salt Lake City, Utah.—City Engr. Ritter is stated to have estimated the cost of paving Market St. at $12,720 and for constructing cement sidewalks at $3,720.

Seattle, Wash.—See "Sewerage and Sewage Disposal."

Seattle, Wash.—Bids will be received Mar. 18 by C. B. Bagley, Bd. Pub. Wks., for constructing concrete sidewalks on Brooklyn Ave.; probable cost, $6,750, and for paving 4th Ave. and Pine St.; probable cost, $8,900.

**Seattle, Wash.*—The following are the bids opened on Feb. 25 for grading Westlake Ave. from Denny Way to Pike St. (bidders all of Seattle): P. J. McHugh, $38,797; Stirratt & Gortz, $34,091; A. C. Goerig, $26,537 (awarded contract); International Constr. Co., $35,498; Holt & Maguire, $31,567, and C. J. Erickson, $31,285. The detail bid of A. C. Goerig, the successful bidder, is as follows: Clearing and grubbing, lump sum, $500; 68,000 cu. yd. earthwork, 20 cts. per cu. yd.; 50 cu. yd. solid rock, 60 cts.; 105 M. ft. sidewalks, etc., $14; 44,000 lbs. bulkhead iron, 5 cts.; 320 M. ft. bulkhead lumber, $15; 8,300 lin. ft. railing, 10 cts.; 350 lin. ft. 8-in. pipe sewer, 75 cts.: 1 4½-ft. manhole, $45, and 100 cu. yd. concrete bulkhead, $8.

Tacoma, Wash.—Local press reports state that bids will be received Mar. 27 by the Bd. Co. Comrs., for improving E. M. St.

Seattle, Wash.—The County Comrs. are stated to have opened the following bids for macadamizing about one mile of the Van de Vanter Road: Bell & Price, $5,400; Seattle Bldg. Co., $6,110 and J. F. Marquand & Co., $6,674.

Wheeling, W. Va.—See "Sewerage and Sewage Disposal."

Racine, Wis.—P. H. Connolly, City Engr., writes that the following are the bids opened on Mar. 4 for paving Douglas Ave. with brick on a macadam foundation; (*a*) 15,960 sq. yd. brick paving; (*b*) 11,263 lin. ft. combined concrete curb and gutter; (*c*) total: Badger Constr. Co., Milwaukee, *a*, $1.67; *b*, 57 cts.; *c*, $33,073; M. H. McGovern, Chicago Ill., *a*, $1.67; *b*, 45 cts.; *c*, $31,722; Jas. Cape & Sons, Racine, *a*, $1.40; *b*, 70 cts.; *c*, $30,227; Smith & Brown, Chicago, Ill., *a*, $1.69; *b*, 50 cts.; *c*, $32,604; R. R. Birdsall, Racine, *a*, $1.42; *b*, 63 cts.; *c*, $29,759; P. B. Johnson, Racine, *a*, $1.46; *b*, 70 cts.; *c*, $31,185; John O. Jones, Racine, *a*, $1.48; *b*, 34 cts.; *c*, $27,450; Harding and Nelson, Racine, *a*, $1.60½, *b*, 60 cts.; *c*, $32,374; N. Reichert, Jr., Racine, *a*, $1.46; *b*, 63 cts.; *c*, $30,397.

Brantford, Ont.—It is stated that bids will be received until Mar. 16 by tne Bd. of Wks. (R. W. Robinson, Chmn.), for supplying paving brick and sewer pipe required by the city during year 1905.

POWER PLANTS, GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

San Francisco, Cal.—The Oro Water, Light & Power Co. is reported incorporated, with a capital of $3,500,000, by J. A. Kretchmars and J. Alexander, of San Francisco, and P. C. Medcraft and L. A. Redman, of Alameda.

The Battle Creek Power Co. is reported incorporated, with a capital of $1,000,000, by Henry Ward Brown and Walter E. Carre, of Colma; Harold L. Wright, of San Francisco, and others.

Santa Monica, Cal.—The Independent Gas Co. is reported formed, with a capital of $60,000, to construct a gas plant at 9th and Colorado Sts. A. E. Robinson, C. C. Rathbone and F. E. Bundy are the directors.

Washington, D. C.—Bids will be received Mar. 21 at the Bureau Supplies and Accounts, Navy Dept., Washington, for furnishing the navy yards at Portsmouth, N. H.; Boston, Mass.; Newport, R. I.; New York, N. Y.; League Island, Pa.; Annapolis, Md.; Washington, D. C.; Norfolk, Va., and Pensacola, Fla., a quantity of electric cable, broken stone, piles, electrical supplies, pine c. i. pipe and fittings, copper galvanized sheet iron, bar and spring steel, sand, iron wire, pig iron, plain, galvanized and pickled sheet steel, copper and iron pipe, valves, fittings, foundry facings, Portland cement, marine cement, bar iron and steel, galvanized sheet steel, etc. H. T. B. Harris, Paymaster Gen., U. S. N.

Ft. Valley, Ga.—The citizens are reported to have voted Feb. 24 to issue $12,000 bonds for establishing an electric light plant and extending the city water works.

Cherokee, Ga.—The Etowah Power Co. is reported organized by A. J. Warner, W. A. Carlisle, and others, of Gainesville: F. P. Burtz, of Canton, and others, with a capital of $10,000, to construct a power plant for Cherokee. It is proposed to begin at once the construction of a dam 600 ft. long and 30 ft. high across Etowah River, about 4 miles below Canton.

Valdosta, Ga.—A. W. Vamedoe, City Clk., writes that the Mayor and Council is investigating the cost of an electric light plant.

Chickamauga Park, Ga.—Bids will be received by Capt. C. Nixon, Q. M., U. S. A., Chattanooga, Tenn., on Mar. 30, for furnishing and installing gas fixtures in 3 buildings at Ft. Oglethorpe, as advertised in The Engineering Record.

Wallace, Idaho.—The Wallace Light & Water Co. (D. C. McKissick, Supt.), will probably install some new machinery this summer, also steam plant.

Hailey, Idaho.—The present owners of the Hailey Electric Supply Co. (Leo. Cramer, Pres.) pfopose building another plant at once.

Morris, Ill.—The Fields Electric Light Co. (F. B. Handwerk, Mgr.) has in contemplation the following improvements: 5 miles of line, a 250-h.p. compound engine, a 200 kw. alternator, one condenser, a pump, day power circuit and all night service.

Elgin, Ill.—The Western United Gas & Electric Co. is reported to have absorbed the Elgin-American Gas Co. The work of building a central gas plant at Joliet will, it is reported, commence at once at a probable cost of $1,000,000. General offices to be located at Aurora. I. C. Copley, Pres., Aurora; Fred. Bennett, Secy., Joliet.

Morrison, Ill.—The franchise for a gas plant which was recently granted to the Crawford Bros. is reported to have been sold to H. S. Green, of Morrison, who is one of the principal owners in the electric lighting plant. He is reported to be planning to commence work on the new gas plant this summer, which will cost $40,000. It will furnish gas for both lighting and fuel. Water gas will be manufactured instead of coal gas.

**Moline, Ill.*—The Westinghouse Electric & Mfg. Co. is building for the People's Power Co. a 1,100-kw., 2-phase alternator, operating at 2,400 and 4,800 volts, and a 600-kw., 600-volt, direct-current machine. A contract for a 24x50x48-in. horizontal compound Reynolds Corliss engine has been placed with the Allis-Chalmers Co.

Galesburg, Ill.—Bids will be received Ma 20 by the City Clk. for furnishing materia and erecting a power house and stack f Bd. Educ. J. Grant Beadle, Archt., Gales burg.

**Hammond, Ind.*—The South Shore Ele Co. have ordered from Allis-Chalmers C Milwaukee, one heavy-duty 24x48-in. eng for direct connection to a 425-kw. Bullock C. generator.

Tulsa, Ind. Ter.—R. E. Lynch, City R corder, writes that it was voted Feb. 21 grant the People's Oil & Gas Co. a fran to wire the city for electricity and pip natural gas.

Centerville, Ia.—Richard Slattery is ported to have petitioned for a franchise an electric light plant.

Osceola, Ia.—John E. Barnard is repo to have secured control of the electric and power plant, and will make extensiv provements.

Ottumwa, Ia.—The Ottumwa Traction Light Co. (J. F. Springfield, Gen. Mgr.) pr poses during this season to build a pow house and increase the installation for ers, engines and generators.

Anthony, Kan.—W. K. Palmer, 718 Dwig Bldg., Kansas City, Mo., has been engaged engineer for the city in connection wi construction of a municipal electric plant. Plans and specifications are now prepared.

Waverly, Kan.—W. K. Palmer, 718 Dwig Bldg., Kansas City, Mo., has secured the tract for engineering services in connecti with the municipal electric light plant an to be constructed by city in conjunction wi the proposed new water works.

Lawrence, Kan.—Press reports state t there is a movement on foot here for a co bination of the gas and electric light plan of the city. About $200,000 will be exper ed immediately, according to the report. A. Sharpe is the chief promoter.

Gretna, La.—R. S. Stearns, 222 Elm Ave., New Orleans, Gen. Mgr. Algiers Wa Works & Electric Light Co., writes that it proposed to extend the system to Gretna a furnish Gretna with light. It is also propo to construct 10 miles of electric railway tween Algiers and Gretna, installing a c plete 3-phase system.

Holyoke, Mass.—Bids will be received M 20 by W. H. Snow, Mgr. Gas and Elec Dept., for gas holder with steel reinfo concrete tank; holder to have capacity about 750,000 cu. ft. and to give about 7 maximum pressure.

Sault Ste. Marie, Mich.—Press reports st that the Edison Sault Electric Co. will c struct a plant this year which will have m than 3,000 h.p. to start with. About $120, will be expended this summer. Alex. Dow Detroit, is reported interested. The plans the plant are reported to have been prepa by Prof. Gardner S. Williams.

Grand Rapids, Mich.—The Grand Ra Gas Light Co. is reported to have decided expend $150,000 in improvements this y to include 4 new buildings and a water plant with a daily capacity of 1,000,000 ft is also proposed to erect next year anot coal gas plant with a similar capacity. exhauster room, a warehouse and men's qu ters will also be erected.

Detroit, Mich.—The Detroit Commer Electric Light Co. is reported formed will apply for a charter. It will petition Council for a franchise, and if same is gra will start work on its plant within 60 d W. E. Fenwick, an attorney; Morris M. Gr M.E., and H. W. Wells, M.E., are reporte be among the directors.

**Duluth, Minn.*—The Great Northern Po Co. is reported to have awarded to Po Bros., of Duluth, the contract for constr ing a canal about 2 miles in length bet. Th son and the top of the hill; contract p reported to be about $300,000.

St. Cloud, Minn.—The Public Service of St. Cloud, is reported organized and thorized an issue of bonds to be used as lows: $70,000 for building a new gas p and $230,000 for improvements in the tric light plant and street railway.

Foley, Minn.—Daniel Stemler, of Minn olis, is stated to have petitioned Vil Council for a 20-yr. franchise for an ele light plant for Foley.

Warren, Minn.—W. Haney, Supt. of the nicipal water works and electric light pl writes that the matter of constructing a plicate electric light plant is in the hand a committee, which will procure an engi and ask for bids.

Wadena, Minn.—The Supt. of the Wat Light Plant is reported to have recomm a heat distributing system, using up the w steam from the plant.

Owatonna, Minn.—C. L. Powell, of B dere, Ill., is reported to have petitioned f franchise for a gas plant.

Aberdeen, Miss.—Bids will be received til Mar. 22 by J. M. Acker, Mayor, for la 7 miles c. i. pipe, building brick power h masonry reservoir, deep well, air compre 18x42 simple Corliss engine, setting chinery, 5 miles 8 to 15-in. sewers, as a tised in The Engineering Record.

Houston, Miss.—J. M. Griffin, Town writes that it was voted Feb. 28 to $13,500 bonds for the construction of w works and an electric light plant.

**Items marked thus give the names of parties awarded contracts.*

Neb.—A. Billings, City Clk., writes s will be received about Apr. 15 for truction of water works and an elec- plant; probable cost, $20,000.

ah, Neb.—The question of issuing bonds to purchase present electric nt or install a new one and operate it nction with the city water works, is under consideration.

ia, N. H.—Bids will be received until by the Mayor for street lighting for of 10 years. For specifications ad- G. Quimby, Chmn. St. Lighting Com., t, N. H.

nouth, N. H.—Bids will be received by Mordecai T. Endicott, Ch. Bureau nd Docks, Navy Dept., Washington, r furnishing in place 3 electric trav- anes at navy yard here; estimated ,500.

sbad, N. M.—Geo. Bruce, of Carlsbad, ted to have secured the contract for cting a dam in Pecos River for the Co., to be used to furnish light and e

ort, L. I., N. Y.—The South Shore has been incorporated, with a capital 000, to operate in Freeport, Baldwin, , Bellmore, Seaford, Massapequa and ille. Directors: Geo. MacDonald and . Wait, Jr., of N. Y. City, and John n, of Wilkesbarre, Pa. It proposes ish gas, electricity and steam.

York, N. Y.—Plans have been filed for y brick, concrete and steel electric light to be constructed at Tompkins St. lancey Slip, for the Dept. of Bridges, City, at a cost of $20,000. H. de B. , Archt., 22 William St.

Bd. of Aldermen on Mar 7 approved olution of the Bd. of Estimate author- . bond issue of $600,000 for a muni- ghting plant.

cton, N. Y.—The question of construct- electric light and power plant is re- under consideration here.

da, N. Y.—C. M. Ruggles, City Clk., that the Madison County Gas & Elec- o., of Oneida, has secured the con- or lighting the streets with electricity, 965.

falo, N. Y.—The Bd. of Supervisors is to have on Feb. 28 voted to award the t for an electric light plant for the egt. Armory to McCarthy Bros. & Ford, ut $90,000.

ara Falls, N. Y.—The City Council is d to have granted to the Niagara Falls ulic Power & Mfg. Co. a franchise to onduits and lay cables for the distribu f electricity for heat, light and power es.

es, N. Y.—The Hudson River Electric reported to have petitioned City Coun- a franchise to establish a plant here to light, heat and power for manufactur- d other purposes, and for lighting the

klyn, N. Y.—The Mayor has approved dinance providing for an issue of cor- stock to the amount of $100,000 to e additional means for placing electrical tors underground in Brooklyn Boro., jurisdiction of the Fire Dept.

nd Forks, N. D.—The Council is re- l to be considering the installation of a ipal plant for commercial lighting.

ana, O.—The City Council is reported ve granted C. H. Marvin and T. A. Ed- son a franchise for an electric light and ater heating plant.

veland, Okla. Ter.—A charter has been ed to the Eureka Oil & Gas Co., of land and Morrison, with a capital of 00. Incorporators. R. E. Boggy, Edw. and W. W. Woolsey.

ario, Ore.—Seymour H. Bell and Chas. ance, of Sumpter, are reported to have ed a franchise for the construction of ctric light plant at Ontario.

ztown, Pa.—The citizens are reported ve voted to issue $15,000 bonds for the ruction of an electric light plant.

rnersville, Pa.—Geo. W. Wertz writes bids will be received Apr. 1 for the con- ion of an electric light plant, to cost).

k, Pa.—It is reported that when spring again work preliminary to the con- ion of an electric power plant on Sus- nna River about 1½ miles below Mc- Ferry will again be resumed.

rion, S. D.—The Town Trus. are re- l to have granted John A. Heeren and Croepel a franchise for water works and ting and heating plant. Acetylene gas robably be used.

uston, Tex.—It is reported that the on Gas Co. is to be reorganized, with resent local owners retaining an inter- and with them Chas. A. Hanna and W. Beall, of New York, and Jas. L. ns, of Montclair, N. J., representing a syndicate also interested. The capital is to be increased from $400,000 to ,000. Extensive improvements and ex- ns of the mains are contemplated.

eoak, Tex.—W. L. Harrison is reported sted in the construction of an electric plant.

b, Utah.—E. T. Wolverton, Mgr. of the Fuel & Iron Co.'s mines in Grand Coun- stated to have petitioned for a large ap- ation of water from Green River, in County, to be used for power and irri- . S. T. Kendrick, a mining man of r, Colo., is reported to be associated E. T. Wolverton.

Payson, Utah.—The citizens are reported to have voted to issue $12,000 bonds to improve the electric light plant.

**Norfolk, Va.*—The Norfolk Ry. & Light Co. is stated to have awarded to the Southern Constr. Co. the contract for installing a conduit system in which all electric light wires south of Queen St. will be placed; probable cost of work, $100,000.

Staunton, Va.—L. S. Randolph, M. E., Blacksburg, writes that bids will probably be received in the fall for the construction of a power plant at the Western State Hospital, to cost from $8,000 to $15,000.

Fredericksburg, Va.—The City Council is reported to have selected property along the Richmond, Fredericksburg & Potomac R. R. Co. as a site for the erection of gas works.

Blaine, Wash.—The City Council is reported to have granted H. L. Jenkins a franchise for the construction of an electric light plant.

Milwaukee, Wis.—The Union Light & Power Co. is reported incorporated, with a capital of $5,000, to manufacture gas and electricity. Chas. Tryon and L. B. Budd are reported to be incorporators.

An ordinance asking for a general franchise to lay pipes to heat buildings from a centrally located plant is reported to have been submitted to Common Council. It was drafted by Turner, Pease & Turner at the request of J. Fails, of Detroit, Mich.

Zapotlan, Mexico.—A company is reported formed by Rafael Arias and D. Villanueva, of Zapotlan, and Salvador Ugarte and Manuel Garcia Fuentes, of Guadalajara, with a capital of $96,000, to establish a water power plant at Piedras Negras Falls of Coviantas River, and furnish current for light and power in Zapotlan, 16 miles distant. The capacity of the plant will be 600-h.p.

Sydney, N. S.—This city is reported to have decided to issue $60,000 bonds, to be used to construct and equip an electric light plant.

Calgary, Alberta, N. W. Ter.—It is stated that bids will be received until Mar. 15 for installing a complete electric light plant. F. W. Thorold, City Engr.

Niagara Falls, Ont.—Press reports state that a bill has passed the Dominion Parliament granting permission to the Niagara & Welland Power Co. to construct a power and ship canal from Welland Canal to Lake Ontario.

ELECTRIC RAILWAYS.

Notes Arranged Alphabetically by States.

Oakland, Cal.—An application for a street railway franchise has been filed by the Oakland Transit Consolidated Ry. to run a line from the city limits southwesterly along Linda Ave.; also along College Ave. to connect with the line on Alcatraz.

Richmond, Cal.—The Richmond, Stege & Oakland Electric Ry. Co. is stated to have applied for franchise to the Bd. of Superv. at Martinez. Harry Ellis, John R. Nystrom and Thos. G. Parker are reported interested.

San Diego, Cal.—H. W. Vincent, City Clk., writes that the San Diego Electric Ry. Co., of San Diego, has secured a franchise on D, State and other streets (bids for which were opened on Feb. 23).

Boise, Idaho.—W. E. Pierce has before the City Council a petition for the establishment of an electric railway, which will extend from this city for several miles into suburban districts.

Boonville, Ind.—The Evansville Suburban & Newburg Ry. Co., which has recently changed from steam to electricity, has made an offer to extend the road to Boonville, on condition that a franchise be given and right of way be secured.

Lafayette, Ind.—Jas. Murdock & Sons, who own a large part of the stock in the Wabash Valley & Fort Wayne Traction Co. are reported to have decided to improve the line by straightening all the curves. The improvements will cost $200,000. At the same time the work of constructing an extension of the line from Logansport to this city by way of Delphi will be begun. The company will build a new power plant in Logansport.

Ft. Wayne, Ind.—The Toledo & Chicago Interurban Ry. Co. proposes to enter this city by an extension of the line from Waterloo. The syndicate has secured a franchise for forty years to use the streets of Auburn. The line is now built as far as Pioneer, Ohio, and the purpose is to build to Goshen in the spring. Incorporators: F. H. Froehleek, John White, G. E. Cummings and others.

Evansville, Ind.—M. S. Sountag is reported to have announced that the Evansville & Eastern Electric Ry. has been financed.

Terre Haute, Ind.—Surveys are being made by the Terre Haute Traction & Light Co., between Terre Haute and Sullivan with a view to building a new electric railway to that town.

Chickasha, Ind. Ter.—The Chickasha Traction Co. has applied to Council for a franchise to operate an electric railway in the city.

Sioux City, Ia.—A new interurban line connecting Sioux City with Niobrara and intermediate points in Nebraska is the latest scheme in interurban railroad circles. J. E. Emerson, of St. James, Neb., has interested a number of Sioux City men in the project. The line would pass through Dakota City, Hubbard, Allen, Daley, Bow Valley, Crofton and Niobrara in Neb.

Henderson, Ky.—H. W. Richardson, Secy.-Treas. of the Henderson St. Ry. Co., is reported to have been in conference with W. N. Coler & Co., of New York, N. Y., and representatives of Gay Bros., of Boston, Mass., and Pfaelzer, Walker & Co., of New York, in reference to the building of an electric railway to connect Evansville, Ind., with Henderson and Owensboro, Ky.

Gretna, La.—See "Power Plants, Gas and Electricity."

Baltimore, Md.—The bids submitted by the concrete construction companies for the erection of the power house on E. Pratt St. for the United Rys. & Electric Co., are reported as being too high, and it has been decided to take estimates for a brick structure. The original plans called for a steel construction building 81 ft. high, covering a surface space of 134x136 ft. The plans were prepared by P. O. Keilholtz, of the Eng.'g Dept.

Ann Arbor, Mich.—The City Council has granted the Toledo, Ann Arbor & Detroit Electric Ry. a franchise upon the condition that it file a bond in the sum of $10,000 that it will complete its road between Ann Arbor and Toledo, within 21 months.

Minneapolis, Minn.—It is reported that the Twin City Rapid Transit Co. will build to Excelsior this summer.

Hillsboro, Mo.—The Big River Construction Co., through A. T. Fisher, its president, has filed a petition in the County Court of St. Louis County, asking for a franchise to build and operate a standard gage railroad, either steam or electric, from the southern limits of St. Louis to the southern boundary line of St. Louis County.

New York, N. Y.—The Rapid Transit Comn. is reported to have decided on Mar. 2 to build an elevated loop by cutting a new short street through the present terminal site to Baxter St. and continuing it in Baxter St. to Delancey St., thence to a connection with the Williamsburg Bridge.

Oneida, N. Y.—A change has been made in the plans of the Oneida & Rome Electric Ry., according to Dewitt C. Hadcock, the promoter. The consents of the property owners along the line have been completed from the Oneida Creek bridge, in this city, through to the New York Central tracks.

Bellefontaine, O.—T. J. Adams, of Columbus, and A. H. Lawrence, of New York, N. Y., are securing right of way for a line from Columbus to Lima, by way of Kenton and Lewiston.

Sandusky, O.—J. C. Parker, promoter of the Sandusky, Clyde, Tiffin & Southern Electric Ry., is reported to have arranged for financing the proposition. Active construction work will be begun in the spring.

Geo. B. Kerper, Jr., and others of Toledo, are promoting a line to extend from Fremont to Sandusky. Practically all the right of way has been secured, and bonds will be placed on the market in the near future.

Columbus, O.—The Columbus, Urbana & Western Ry. Co. is said to be investigating the advisability of changing its proposed route to take in Plain City, Unionville, Milford Center, North Lewisburg, Bellefontaine and Lima.

Coshocton, O.—The Zanesville, Cambridge & Coshocton Ry. Co. may build a city line in Coshocton, making connection with the interurban line on the outskirts of the city. W. A. Ginn, Ch. Engr., Columbus.

Canton, O.—J. E. Monnot, of Canton, is promoter of the Canton & Youngstown Ry., and options are being taken all along the proposed route. There are possibilities for a water power near Deerfield, and the company proposes to erect a dam and establish its power plant at that point.

Zanesville, O.—The Zanesville, Coshocton & New Philadelphia Traction Co., with J. W. Cassingham and J. A. Hanlon, of Coshocton; C. H. Ferguson, of West Lafayette, and others, as incorporators, proposes to build a line by way of Dresden, Trinway, Coshocton, New Comerstown and Port Washington.

The Zanesville, Cambridge & Coshocton Ry., headed by S. H. Nicholas, of Coshocton, and W. D. Ginn, of Columbus, is working on right of way for a line from Zanesville to New Philadelphia.

New Straitsville, O.—Ed. S. Martin, of New Straitsville, has arranged for the financing of the Perry Electric Ry., Light & Power Co., which proposes to build from Zanesville to New Straitsville. C. A. Donahue, of New Lexington; A. Bringardner, of Junction City; W. E. Finck, of Somerset, and E. S. Martin, of New Straitsville, are interested in the company.

Toledo, O.—The Toledo, Port Clinton & Lakeside Ry. Co. has obtained a franchise to extend its line through the Lakeside encampment grounds. The line will be extended to Lakeside this spring.

The Co. Comrs. are stated to have granted a franchise to the Toledo Interurban R. R. Co. for right of way along Monroe St. to the county line. The company expects to build to Ottawa Park and Sulphur Springs, making a belt line.

Blanchester, O.—The Cincinnati, Milford & Loveland Traction Co. is reported to be pushing work of securing right of way between Milford and Blanchester. The road is in operation to Milford, and work of extending it will be started as soon as the weather permits. B. H. Kroger, Cincinnati, Pres.

Harrisburg, Pa.—The owners of the Hunter's Run & State Belt R. R. are reported to have in contemplation the converting of this short line into an electric railway. It extends from a connection with the Philadelphia & Reading Ry. at Hunter's Run, Pa., to Pine Grove Furnace, a distance of about 10 miles.

Carlisle, Pa.—The proposed extension of the Carlisle & Mt. Holly Electric Ry. from Mt. Holly to Gettysburg, a distance of about 22 miles, will probably pass through Hunter's Run, Bendersville, Arendtsville, Beechersville and Mummasburg. The road will be rock ballasted and have 80-lb. steel rails, making high speed possible.

Bellefonte, Pa.—Town Council has approved the franchise ordinance of the Bellefonte Traction Co., which proposes to operate a line between Bellefonte, State College and Milesburg.

York, Pa.—Engineers are surveying in Wrightsville for the York & Wrightsville Elec. Ry. It is reported that the line will be extended to the Susquehanna River Bridge.

Corry, Pa.—An ordinance has been introduced in Councils granting a franchise to C. P. Northrop and associates to construct an electric railway through the city. Surveys have also been completed for an electric railway between Corry and North East via Findley Lake.

Patton, Pa.—The Northern Cambria St. Ry. Co. is reported to have in contemplation the construction of an electric railway from Patton to St. Boniface, Hastings, Barnesboro, Spangler, St. Benedict, Carrolltown and Patton. F. D. Scanlan, Philadelphia; C. L. D. Tennis, Pittsburg, are among the directors.

New Holland, Pa.—A charter is reported to have been granted to the New Holland, Blue Ball & Terre Hill Electric Ry. Co.; capital, $36,000. The line will be 6 miles long. J. F. Seidomridge, Pres.

Gettysburg, Pa.—The Carlisle & Mt. Holly Electric Ry. Co. is reported to have secured all rights of way for the extension of that line from Mt. Holly to this place, and that the work of building the line will be commenced in early spring. Patricio Russ, of Harrisburg, is the principal promoter.

Mahanoy City, Pa.—A charter is reported to have been granted to the Mahanoy City & Tamaqua St. Ry. Co., with a capital of $60,000, to construct a line 10 miles in length. It will extend from Mahanoy City to Tamaqua via Park Place, Delano, Grier City, Lakeside, Barnesville and Mentzer. E. M. B. Shepp, Tamaqua, Pres.

Hanover, Pa.—The York County Traction Co. has secured franchises for all the principal streets of Hanover. The franchises for all the streets of the borough were granted to the McSherrystown Street Railway Co., which is practically the York County Traction Co., having been merged by the recent purchase by the local company. W. H. Lanius, of York, is the president of the company.

**Boston, Mass.*—The following are the bids opened on Feb. 14 by the Boston Rapid Transit Comn. for constructing Section 4 of the Washington St. tunnel; (*a*) Jones & Meehan, 1 Beacon St.; (*b*) Shailer & McCormick, 101 Tremont St.; (c) Gow & Palmer, 50 Congress St.; (*d*) Coleman Bros., 15 Court Sq.; (*e*) Seeley-Taylor Co., Tremont Bldg.; (*f*) Patrick McGovern, 6 Beacon St.; (*g*) Hugh Nawn Contr. Co., 82 Savin St. (awarded contract):

	a.	*b.*	*c.*	*d.*	*e.*	*f.*	**g.*
49,000 cu. yd. earth excavation, including backfill. .	$4.60	$5.30	$5.00	$4.50	$4.60	$4.75	$5.00
200 lin. ft. excav., tunneling, in Summer St,, etc.	15.00	20.00	15.00	12.00	12.00	22.00	17.00
8,500 cu. yd. concrete	10.00	11.50	12.50	11.50	12.00	12.50	11.00
1,500 " concrete for roof north of Sta. 23 + 11	12.00	14.50	14.00	13.00	14.00	13.50	15.00
300 " brick masonry for manholes, etc.....	20.00	18.00	18.00	20.00	22.00	16.00	17.00
Laying vit. pipe sewer:							
200 lin. ft. 24-in.	2.00	1.50	1.00	1.00	2.00	2.00	1.25
700 " 18-in.	1.50	1.30	.70	1.00	1.80	1.50	1.00
760 " 15-in.	1.20	.80	.60	.75	1.50	1.00	.70
700 " 8-in.	1.00	.60	.30	.50	1.20	.75	.60
60 " 6-in.	.90	.50	.20	.40	1.00	.30	.50
1,000 " 3 and 4-in.	.80	.40	.15	.25	.80	.15	.30
Setting and securing:							
200 tons steel, wght. less than 6 lbs. per lin. ft.	14.00	13.00	12.00	15.00	25.00	15.00	12.00
500 tons steel, wght. 6 lbs. or more, per lin. ft. . .	14.00	15.00	15.00	20.00	25.00	20.00	15.00
3,000 sq. yd. coating Portland cement mortar.....	.50	.60	.50	.75	1.00	.50	.50
10 cu. yd. grout: 1 Portland cem. to 1 sand. .	25.00	28.00	.25.00	50.00	25.00	20.00	25.00
11,000 sq. yd. waterproof coating, pitch or asphalt. .	.50	.40	.50	.40	.75	.40	.30
19,000 " tarred felt, pitch, etc...............	.30	.15	.25	.20	.50	.25	.20
Underpinning, supporting & protecting bldgs, etc.	151,000	80,000	83,000	109,000	78,125	74,000	76,000
Total	$515,066	$490,698	$487,068	$481,194	$478,525	$469,203	$466,482

Items marked thus give the names of parties awarded contracts.

York, Pa.—The York County Traction Co. has purchased a site on N. George St., and will erect a large passenger and freight station thereon next spring. The company will put in switch connections with both the Northern Central and Western Maryland Railroads at that point.

Sunbury, Pa.—Burgess Smith has signed the ordinance granting a franchise to the Shamokin Extension Electric Ry. Co.

New Holland, Pa.—The charter for the 6-mile electric railway of the New Holland, Blue Ball & Terre Hill Co. has been received at the Recorder's office; capital, $36,000. J. F. Seldomridge, J. B. Long, W. M. Franklin are reported to be the directors.

Newcastle, Pa.—The Sharon & Newcastle Traction Co. has applied for a 50-year franchise in Newcastle.

Columbia, S. C.—A bill has been introduced in Senate to incorporate the Cherokee, Spartanburg & Union Ry. This will probably be an electric railway which will run from Hendersonville to Gaffney by way of Chimney Rock, and via Cliffville. Capital $250,000. Incorporators: T. B. Butler, of Cherokee; A. N. Wood, of Gaffney, and John B. Cleveland, of Spartansburg. Whether or not the motive power will be steam has not been definitely decided.

Texarkana, Tex.—Col. E. J. Spencer, Pres. of the Texarkana Traction Co., is reported to be looking for a site on which to erect a power plant.

Logan, Utah.—A petition has been submitted to City Council asking for a franchise for an electric street railway. David Eccles, of Ogden, is reported to be interested.

Salt Lake City, Utah.—The Salt Lake & Ogden Ry. Co. (Simon Bamberger, Pres.) is reported to have sumitted a new petition to Council for a franchise for an electric railway over certain streets in the city. The new petition states that the company has completed arrangements for equipping its entire line from this city to Ogden with electric appliances.

Bennington, Vt.—The Bennington & North Adams St. Ry. Co. has been incorporated, with a capital of $150,000, and work on the construction of the road from the Williamstown line to Bennington, Vt., is expected to be started in the spring. Directors. W. H. Bradford, Bennington; Frank S. Richardson, of North Adams, Mass.; A. E. Hall, of Williamstown, Mass., and others. The route proposed for the road, which has already been surveyed, is from Bennington, through Pownal, Williamstown to North Adams, and the entire length of the road is 18 miles. Bids for the construction of the Bennington & North Adams Street Railway and for the extension of the Hoosac Valley Street Ry., will be received March 15, according to the report.

Chehalis, Wash.—The Chehalis & Eastern R. R. Co. has been incorporated, with a capital of $2,000,000, to build an electric railway from Chehalis to Sulphur Springs, about 75 miles. Incorporators: Francis Donohue, C. O. Gingrich, John T. Coleman, and others.

Milwaukee, Wis.—The Milwaukee & State Line Ry. Co., of Milwaukee, organized to construct and maintain 34 miles of road through Milwaukee, Racine and Kenosha counties, has filed articles of incorporation; capital, $10,000. Incorporators: Chas. L. Lowe, Clarence B. Hale and John M. Mariga, all of Chicago, Ill.

Mattoon, Wis.—Surveys are reported as being made for the Red River Valley Electric Ry. The road will begin at Clintonville, Wis., and end at Antigo, the line passing through Eland Junction, Mattoon and Phlox. F. C. Delano, of Philadelphia, Pa., Chmn. Bd. of Directors.

RAILROADS.

Notes Arranged Alphabetically by States.

**Durango, Colo.*—The Denver & Rio Grande R. R. Co. is stated to have awarded to Kilpatrick Bros., of Beatrice, Neb., the contract for the construction of a branch line, 52 miles long, from Durango to Farmington, N. M. E. J. Yard, Ch. Engr., Denver, Colo.

Sylvania, Ga.—The Sylvania & Burtons Ferry R. R. Co. is reported formed, and is about to apply for a charter. The proposed line is 18 miles in length, and will run in a northerly direction from Sylvania, crossing Brier Creek at Mill Haven. Only the distance from Sylvania to Brier Creek, about 9 miles, will have to be built, the remaining 9 miles being now in operation by a lumber company, of which R. C. Neely, of Waynesboro, is the head.

Indianapolis, Ind.—Governor Hanley has signed the Indianapolis track elevation bill. The bill is designed to give the city elevated tracks, authority to require the railroads to comply with the bill's provisions being vested in the Bd. of Pub. Wks. One provision of the bill says the city shall not order more than $400,000 of improvements in the way of elevated tracks in one year.

Topeka, Kan.—Press reports state that plans have been completed by the Chicago, Rock Island & Pacific Ry. (W. L. Darling, Ch. Engr., Chicago, Ill.) for double tracking the 82 miles of its line between Topeka and Harrington.

**Thief River Falls, Minn.*—Winston Bros. Co., of Minneapolis, are stated to have secured the contract for grading and timber work on the new Thief River Falls extension of the Soo road. The new stretch of road will extend from Thief River Falls to Kenmare, a distance of 300 miles.

Auburn, N. Y.—The New York, Auburn & Lansing R. R. Co. is stated to have been granted permission by the State Bd. of R. R. Comrs. to issue mortgage bonds to the value of $1,000,000. Of this amount $200,000 can be issued at the present time. The company has a charter to construct and operate a road from Auburn to Ithaca.

Brooklyn, N. Y.—The New York Connecting R. R. Co. is reported to have petitioned the Bd. of Aldermen for a franchise for a freight railroad from Bay Ridge to Port Morris through Brooklyn.

Binghamton, N. Y.—Press reports state that the Delaware, Lackawanna & Western R. R. Co. (L. Bush, Ch. Engr., Hoboken, N. J.) proposes expending about $100,000 in improvements in its yards in this city, and in the construction of a new bridge over Court St.

Philadelphia, Pa.—Local press reports state that the Philadelphia & Reading Ry. Co. (Wm. Hunter, Ch. Engr., Philadelphia) is willing to pay $3,000,000 as its share for the removal of the 9th St. grade crossings.

Arrangements are reported to be completed bet. the Survey Bureau and the Pennsylvania R. R. Co. (W. H. Brown, Ch. Engr., Philadelphia) to abolish grade crossings on Trenton Ave. The entire cost of the work will be $1,500,000, of which the city will pay $750,000.

**Lewistown, Pa.*—The contract for changing its line and the construction of 2 stone arch bridges over Juniata River near Lewistown, is stated to have been awarded to the Eyre Constr. Co., of Philadelphia, by the Pennsylvania R. R., on Mar. 2. The cost of the improvements is estimated at $1,000,000. The bridges are to be built at Mayes and Granville, replacing similar structures. The proposed structures will be erected for 4 tracks, and will be of 8 spans each. The line between the two bridges, a distance of about 1½ miles, will be increased from 2 to 4 tracks and a curve abolished.

Harrisburg, Pa.—Press reports state that bids will soon be asked by the Philadelphia & Reading Ry. Co. (Wm. Hunter, Ch. Engr., Philadelphia), for double-tracking its Philadelphia, Harrisburg & Pittsburg line between Harrisburg and Shippensburg, a distance of 41 miles; probable cost of work, $500,000.

Norfolk, Va.—Bids will be received until Apr. 15 by the Tidewater Ry. Co., Beckley, W. Va., for the graduation, including masonry, of 20 sections, 5 miles each, of the Tidewater Ry., extending west from Sewall's Point (near Norfolk), Va., a distance of 100 miles, as advertised in The Engineering Record.

Suffolk, Va.—The State Senate has passed the bill authorizing the Suffolk & Carolina R. R. Co. (J. C. Little, Ch. Engr., Suffolk) to construct lines in Tyrrell and Hyde Counties.

Danville, Va.—The Southern Ry. Co. (D. W. Lum, Ch. Engr., Washington, D. C.) is reported to be preparing to double track the line between this city and Stokesland, a distance of 5 miles.

Berlin, Wis.—The Berlin, Princeton & Western Ry. Co. is reported organized to construct a railroad from Berlin to Necedah, a distance of 77 miles. Capital, $25,000. Incorporators: Henry Behm, Fred G. Gale and others, all of Chicago.

Diana, Wis.—A charter has been granted to the Grassy Creek R. R. Co., with a capital of $25,000, to construct a line from a point in the eastern part of Webster County to Pickens, a distance of 15 or 20 miles.

PUBLIC BUILDINGS.

Notes Arranged Alphabetically by States.

Sacramento, Cal.—The Senate has passed a bill appropriating $180,000 for the erection of buildings, and equipping the State fair grounds at Sacramento for expositions and State fair puposes.

Oakland, Cal.—A bill has been passed by the Senate appropriating $25,000 for a work shop at the Home for Adult Blind in Alameda County.

Sacramento, Cal.—The Senate Finance Com., it is reported, has decided to report favorably on the bill appropriating $352,925 for the improving and remodeling of the State Capitol.

**Point Bonita, Cal.*—Capt. W. C. Wren, Q. M., U. S. A., San Francisco, writes that the following are the bids opened on Feb. 13 for the construction of 21 buildings at this post. The buildings will be frame with foundations of concrete (bidders of San Francisco, unless otherwise mentioned):

*Construction proper: Jas. B. McSheehy, $276,775; Jas. Campbell, Flood Bldg., San Francisco, $189,704 (awarded contract); Wilson-Lyon Constr. Co., $234,936; P. P. Quinn, $200,679; F. A. Williams, $220,009; Burrell Constr. Co., $227,124; I. Hirshfeld, $203,575; Richard McCann, $233,218, and S. H. Robinson, $221,245.

*(*a*) Plumbing; (*b*) heating: Wm. S. Snook, *a*, $15,924; Robt. Dalziel, Oakland (awarded contract), *a*, $15,000; *b*, $15,356. John G. Sutton, *b*, $15,450; J. P. Doherty, *a*, $18,575; Burrell Constr. Co., *a*, $15,006; *b*, $15,356. Young & Potter, Seattle, Wash., *a*, $20,556; *b*, $17,938. California Eng. & Constr. Co., *a*, $16,602.

*Electric wiring: H. L. Tittle, $2,971 (awarded contract); Burrell Constr. Co., $3,933 and Joshua Hendy Machine Co., $4,760.

Hannah Bros.' bid for all work complete, $284,705.

Hartford, Conn.—The Police Bd., it is stated, has reported to the City Council in favor of an appropriation of $20,000 for new steel cells at the police station.

Washington, D. C.—Congress has received from the joint Comn. of the House and Senate the plans and recommendations which the Comn. has adopted for the extension and completion of the Capitol Bldg. The cost is estimated at a total of about $1,330,000. Carrere & Hastings, Archts., N. Y. City.

Madison, Ga.—It is reported that the Co. Comrs. have accepted plans and have decided to erect by direct taxation, a court house to cost about $40,000. It is stated that bids for its erection will soon be asked.

Moscow, Idaho.—The Carnegie Library Bd., it is stated, has decided to accept the plans submitted by Watson Vernon, of Boise, for the new library on condition that the cost for the erection of the building does not exceed $10,000.

Edwardsville, Ill.—The Bd. of Directors of the Library Assoc., it is stated, has engaged Paul O. Moratz, of Bloomington, to prepare plans for the library which it is proposed erecting of Bedford stone and brick.

Decatur, Ill.—The following are the bids opened on Feb. 23 by the Superv. Archt., Treas. Dept., Washington, D. C., for the construction complete, of a U. S. Post Office at Decatur: Winchester & Cullen, Janesville, Wis., $57,441; W. H. Cook, Rockford, $54,900; English Bros., Champaign, $57,599; C. H. Gindele Co., Chicago, $52,500; W. F. Stillwell, Lafayette, Ind., $57,093; John A. Simpson, Lincoln, $62,530; Edw. Henry, Tipton, Ind., $53,272; W. J. Turner Co., Chicago, $51,488, and G. Maffioli, Rockford, $56,987.

South Bend, Ind.—The Co. Comrs. and the Co. Council, it is stated, have decided to erect a new county infirmary 2 miles north of this city at a cost of about $75,000.

Ft. Wayne, Ind.—The Trus. of the Lutheran Hospital, it is stated, are considering the enlarging of the Hospital at a cost of $20,000.

Ft. Riley, Kan.—Bids will be received by Capt. Leon S. Roudiez, Q. M., U. S. A., on March 30, for the construction of a subsistence storehouse and a building for care and treatment of sick animals, as advertised in The Engineering Record.

Waterloo, Ia.—Bids will be received Mar. 30 by Jas. Knox Taylor, Superv. Archt., Treas. Dept., Washington, D. C., for installing low temperature hot water heating apparatus in U. S. Post Office and Court House here.

Davenport, Ia.—The Bd. of Control, at Des Moines, has had plans prepared by Liebbe, Nourse & Rasmussen, of Des Moines, for a laundry building, kitchen and combination store building and cold storage plant which is to be erected at the Soldiers' Orphan Home here, at an approximate cost of $21,000.

Des Moines, Ia.—The following are reported to be the lowest bids received Feb. 28 on various parts of the work in connection with the erection of the court house: Carpenter work, mill work, hardware and glass, Martin Culberson & Co., $34,221. Marble work, tile and cement floors. Des Moines Marble and Mantle Co., $63,700. Plastering, J. T. Cook, $33,446. Electric wiring, Geo. A. Keyes, $6,500. Ornamental iron work, Twin City Iron & Wire Works, $24,980. Elevators, Warner Elevator Manufacturing Co., $8,940. Scagliola, Grahl-Peterson Co., $23,960.

Glenwood, Ia.—Liebbe, Nourse & Rasmussen, Des Moines, Ia., it is stated, are preparing plans for several buildings to be erected at the Glenwood Insti. for Feeble Minded, by the State Bd. of Control, at Des Moines, the total cost to be about $50,000. The buildings are to include a boiler and engine house, cold storage plant and reserve coal sheds. It is reported that it is expected that the contract for the construction will be awarded in about a month.

Ft. McKinley, Me.—Bids will be received until Apr. 5 by Capt. A. W. Yates, Q. M., U. S. A., Portland, for constructing 5 buildings, including electric wiring and plumbing, at Ft. McKinley.

Baltimore, Md.—Bids will be received until Mar. 22 by the Bd. of Awards, for furnishing material and erecting the fish market at the Centre Market space. Bids on foundation and superstructure of the building to be submitted separately. Plans may be secured on a deposit of $50, the same to be refunded if the plans are returned before the opening of bids. Probable cost $100,000. Edw. D. Preston, Inspector of Bldgs.

Attleborough, Mass.—Bids will be received Mar. 27 by C. S. Holden, M. D., Secy. Bldg. Com., for erecting a library; bids for ventilating and heating to be submitted separately. McLean & Wright, Archts., 110 Tremont St., Boston.

Brockton, Mass.—It is stated that the Governor has authorized the loan of $30,000 for the erection of an armory in this city.

Battle Creek, Mich.—The following are the bids opened on Mar. 6 by the Superv. Archt., Treas. Dept., Washington, D. C., for the construction (except heating apparatus) of U. S. Post Office at Battle Creek: Kramer Mfg. Co., Richmond, Ind., $75,113; Chas. Hoetz & Son, Grand Rapids, $86,543; E. W. Reid & Co., Flint, $93,900; R. Robertson & Co., Detroit, $90,785; C. E. Corson, Chicago, $77,799; McCarty Bros., Chicago, $91,550; H. V. Snyder & Son, Chicago, $98,544; C. A. Howard, Jackson, Mich., $74,949; C. W. Gindele Co., Chicago, Ill., $75,500; General Constr. Co., Milwaukee, Wis., $75,305; Geo. Richmond & Sons, Kalamazoo, $95,000.

Greenville, Mich.—It is reported that the erection of a court house, jail and sheriff's residence either at Greenville or Stanton, to cost about $40,000, is under consideration.

Grand Haven, Mich.—Bids will be rec
Mar. 22 by Jas. Knox Taylor, Superv. A
Washington, D. C., for installing a plu
system in U. S. Post Office and C
House here, not at Grant Rapids, as
viously stated.

Adrian, Mich.—The following are the
opened on Mar. 2, by the Superv. A
Treas. Dept., Washington, D. C., for cons
ing complete U. S. Post Office at Adrian
Henry, Tipton, Ind., $45,793; General
Co., Milwaukee, Wis., $45,392; C. F.
thews, Adrian, $48,725; Geo. Rechman &
Co., Kalamazoo, $49,500, and W. J. McA
Dixon, Ill., $46,000.

Jackson, Miss.—P. J. Krouse, of Mer
has been selected as architect for the
Methodist Orphanage to be erected at J
son, to cost $30,000.

Kansas City, Mo.—Plans prepared by
bert Turney, Massachusetts Bldg., for a
headquarters building which is to be ere
at Central and 10th Sts., have been appr
They provide for a 3-story brick and
fireproof building 100x162 ft., estimate
cost $90,000. The Bd. of Pub. Wks. has
approved plans for a fire station to be er
at 31st and Holmes Sts., to cost $15,000
for a repair shop and fire station t
erected at 6th St. and Prospect Ave. and
$25,000.

Louisiana, Mo.—The following are the
opened on Feb. 28 by the Superv. A
Treas. Dept., Washington, D. C., for the
struction complete, of the U. S. Post O
at Louisiana, Mo.: Paducah Constr
Paducah, Ky., $33,576; English Bros., C
plain, Ill., $34,840; Morse Constr. Co.
peka, Kan., $33,999; W. R. Oder, C
$31,347; F. W. Menke Co., Quincy, Ill
752; J. W. Kenry, Louisiana, $31,400.
Stewart, Louisiana, $34,650; Cuthbert &
gent, Topeka, Kan., $31,950; M. Yerg
Son, Danville, Ill., $32,340; Latimer &
nings, Kansas City, $32,000, and De
Weuzel, Joplin, $31,365.

Hastings, Neb.—The following are t
lowest bids opened on Mar. 1, by the Su
Archt. Treas. Dept., Washington, D. C.,
ventilating and low-pressure steam h
apparatus for U. S. Post Office at Has
Allen Black Co., St. Paul, Minn., $4,33
M. McGuire, Minneapolis, Minn., $4,343
Mfg. Co., Oskaloosa, Ia., $4,352.

Dover, N. H.—A bill has been passed
House to establish a State sanitarium
consumptives and appropriating $50,00
the purpose.

Trenton, N. J.—A bill has passed the
ate authorizing the erection of a wing
State Prison to cost $250,000.

**Albany, N. Y.*—John J. Kelly, 186
dan Ave., it is reported, has received th
tract to erect the smallpox hospital at
694.

Bids will be received Mar. 21 by R. J
Supt. Pub. Bldgs., at Capitol, Alban
plumbing improvements in basement of
House here. G. L. Heins, State Archt

**Binghamton, N. Y.*—The Bd. of Sup
is reported, has recommended for awa
bid of John P. Kelly, of Schenectady,
electrical work in the armory, at $6,63
that of J. S. Goodenow, of Utica, f
heating work at $5,417.

Rochester, N. Y.—The city authori
is reported, are contemplating the erec
a headquarters building for the Fire D

**Ft. Wood, N. Y. H., N. Y.*—Capt.
Norman, Q. M., 8th Infy., U. S. A., Gov
Island, N. Y. H., writes that contra
construction, etc., of buildings at Fort
(Bedloe's Island), N. Y. H., have been
ed as follows:

Double Set of Captains' Quarters:
struction proper and wiring, to Conra
ett, N. Y. City, $21,900; plumbing t
J. Mullen, N. Y. City, $1,700, and
to Geo. Hildebrand, N. Y. City, $950.

Double Set Lieutenants' Quarters
struction proper and wiring, Conrad
$17,340; plumbing, Ralph J. Gerstle
Y. City, $1,011, and heating, Wm.
Co., N. Y. City, $790.

Double Set N. C. S. O. Quarters: C
tion proper to Geo. W. Wines, East
L. I., $6,300; plumbing to John J.
N. Y. City, $600; wiring to Conrad
$160.

Storehouse: Construction proper a
ing to Conrad Hewett, $25,080; plum
John J. Mullen, $900; heating to Wm
Co., $830.

Jamaica, L. I., N. Y.—The Trus.
Otillie Orphan Asylum, it is repor
tend erecting a 2-story and basement
175x75 ft., opposite the Jamaica
School to cost about $100,000. Wm
Secy., 232 Grove St., Brooklyn.

**Flushing, L. I., N. Y.*—Contr
erecting the armory at Flushing, bid
Feb. 7 by the State Bd. of Armory C
Albany, were opened on Mar. 6 as
Construction to Hudson Valley Con
Troy, N. Y., $62,900; heating to Cl
Co., Boston, Mass., $3,200; plumbing
L. Fitzgerald, Albany, N. Y., $2,860.
tric wiring to John P. Kelly, Sch
N. Y., $3,690.

Syracuse, N. Y.—It is reported th
have been submitted for the $40,0
tion which it is proposed erecting
Hospital for Women and Children.
V. Tracy, Chmn. Bldg. Com.

North Hempstead, L. I., N. Y.—
payers, it is stated, have adopted a
recommending the erection of a t
and a town clerk's office, with firepro
to cost about $20,000.

Items marked thus give the names of parties awarded contracts.

, *N. Y.*—A bill has been signed by r authorizing the city to issue ock amounting to $1,250,000 for ts to the Metropolitan Museum

orted that John R. Sheehan, 160 is secured the contract for metal- d furnishings, electric work, etc., rooms assigned to the Dept. of the Hall of Records, at about

nce has been signed by the Mayor or the issue of corporate stock to $98,000 for the improving, per- bettering and equipping buildings urisdiction of the Dept. of Health.

, *N. Y.*—The erection of annex to harine Hospital, estimated to cost reported under consideration.

ld, O.—The Monroe County Court s reported, has been destroyed by

d, O.—It is stated that plans have eted for an addition which is to be the spring to the Infant Orphans' 01 Forest St.

ti, O.—Bids were opened on Feb. e Bd. of Trus. Memorial Assoc. nnaford, Hulbert Blk., Archt.) for a Sailors' & Soldiers' Memorial

mp sum bid; (*b*) add for granite— el Bldg. Co., Cincinnati, *a*, $167,- 46,000. W. H. Ellis & Co., Cincin- 144,561 (awarded contract, accord- eports); *b*, $44,000. Jas. West- Co., Columbus, O., *a*, $195,000. L. & Co., Cincinnati, *a*, $163,485; *b*, A. F. Withrow & Co., Charleston, $173,000. Andrew Dall & Son, O., *a*, $173,331; *b*, $43,000. Louis , Cincinnati, *a*, $173,400; *b*, $98,-

west separate bids received for the re as follows: Excavating and ma- . Meier, $5,620; brick work, D. Hum- . Co., $12,089; cut stone, D. Hum- Co., $48,450; if granite is used, Granite Co., $81,400; fireproofing, n Fire Proofing Co., $6,027; rein- oncrete, Expanded Metal Fire Proof 00; iron and steel, Potthoff & Frey ., $24,500; plastering, Jos. M. Mur- 20; plumbing and gas-piping, Jas. J. ,310; painting and glazing, Wm. L. $1,498; marble work, Great Western Wks. Co., $13,888; carpenter work, & Taft, $20,094; comp. floors, As- Co., $2,100; sheet metal work, E. & Bro., $2,143; electric light and iring, Central Electric Co., $1,627, ing and ventilating, Peck-Williamson Vent. Co., $6,657.

will be received Mar 28 by the Bd. Public Library, of Cincinnati (Robt. , Chmn. Bldg. Com.), for erecting a branch library at Vine and Daniel luding masonry, structural iron, cut arpenter, roofing and sheet metal umbing, gas fitting, heating, electric c. Plans and specifications prepared L. Tilton, Archt.

. Lakeman, Secy. Bd. Pub. Safety, hat the contract for erecting a 2-story gine house at 7th and Sycamore Sts., g iron work (bids opened Feb. 27), n awarded to L. P. Hazen & Co., of ati, for $52,769.

ay, O.—The following are the bids on Mar. 7 by the Superv. Archt., Treas. Washington, D. C., for the construction e of U. S. Post Office. at Findlay: nry, Tipton, Ind., $39,270; M. Hertz, nd, $39,769; Hamilton-Irvin Co., Fair- W. Va., $35,500; J. A. Schumacher lianapolis, Ind., $42,500; F. Wertz Co., Dover, $38,300; Horn & Alger Bros., , $39,518; Kramer Mfg. Co., Rich- Ind., $39,796, and Mankin Constr. Co., nd, Va., $39,881.

wnee, Okla. Ter.—O. C. Campbell, of ma City, it is reported, has secured the t to erect the Carnegie Library at 14,000.

and, Ore.—The following are reported the bids received Feb. 13 for erecting Y. State building at the Lewis & Exposition: Goldie Bros., $19,740; t Constr. Co., $19,500; Stewart & w, $18,225; P. E. Donovant & Co., ; Burrell Constr. Co., $15,720; E. A. $15,700, and Robt. Wakefield, $14,920. Washington Comn. of the Lewis & Exposition, it is stated, has accepted ns of Heide & De Neuf, of Seattle, for shington State building.

adelphia, Pa.—Henderson & Co., 1221 t., it is stated, have received the con- or erecting the Frankford Branch Li- and the Philadelphia Steam Heating 13 Filbert St., the contract for the and lighting of the building, the cost ding and equipment to be about $55,-

following bids are reported to have eceived by the Co. Comrs., for erect- House of Detention for juvenile prison- 22d and Arch Sts.: Henderson & Co., rch St., $78,277 (awarded contract); & Doak, $81,884; John R. Wiggins & 8,876; John W. Emery, $97,196.

Chester, Pa.—The following are the ened on Feb. 21 by the Superv. Archt., Dept., Washington, D. C., for construc- mplete of the U. S. Post Office at West : Lynch Bros., Philadelphia, $40,980; Reilly, Philadelphia, $35,458; Plum- Jeffries, West Chester, $42,867; Camp- Jeffries, Kingston, N. Y., $48,700; & Co., Philadelphia, $36,885; Fissel & , New York, N. Y., $37,676; Richard- Burgess, Washington, D. C., $38,079; Payne Co., Philadelphia, $49,741; R. linger, Philadelphia, $41,547; W. H. West Chester, $40,731; G. T. Guthrie, gtown, $44,350; Mankin Constr. Co., ond, Va., $39,952, and Chas. McCaul hiladelphia, $36,470.

Pittsburg, Pa.—It is stated that a branch of the Carnegie Free Library is to be erected downtown, especially for business men. It is reported that Andrew Carnegie has promised to give $500,000 toward the project.

Memphis, Tenn.—Levi Joy, Secy. Shelby County Court House Comrs., writes that the Commission has just been organized, but no plans have yet been prepared. It is proposed to erect a $1,000,000 court house in Memphis in the near future. N. C. Perkins, Chmn.

Corsicana, Tex.—It is reported that bids will be received Apr. 1 by the Co. Comrs. for erecting new and removing old court house.

Ft. D. A. Russell, Wyo.—Capt. W. S. Scott, Q. M., U. S. A., Cheyenne, writes that the following are the bids opened on Feb. 15 for the construction proper of certain buildings at Ft. D. A. Russell: M. P. Keefe, Cheyenne, $215,729; Russell & Walker, Colorado Springs, Colo., $216,599; A. I. Gray, Denver, Colo., $210,486; Brown & Schrepferman, Denver, Colo., $224,421; Stocker & Fraser, Denver, Colo., $222,805; Ziegler & Dalton, Junction City, Kan., $212,750; J. L. Betts, Topeka, Kan., $215,668; Fraser, Richardson & Co., Denver, Colo., $214,906; J. W. Atkinson, Colorado Springs, Colo., $225,000; C. E. McGarvey, Cheyenne, $212,400.

*Capt. W. S. Scott, Q. M., U. S. A., Cheyenne, writes that contracts for the construction of the above buildings have been awarded as follows: To Jos. B. Betts, Topeka, Kan., for 2 d. s. Captain's Quarters, $18,510 each, and 2 dbl. Cav. Barracks, $49,612 each. To M. P. Keefe, Cheyenne, for 1 d. s. Lieut.'s Quarters, $14,510; 1 add. to guardhouse, $9,400, and 1 add. to Q. M. Storehouse, $4,289. To Chas. E. McGarvey, Cheyenne, for 1 Field Off. Qrs., $12,100; 1 Bach. Off. Qrs., $28,400, and 1 Wagon Shed, $3,000.

Ottawa, Ont.—It is reported that the House has passed the following bills: Appropriating $442,000 for buildings in Manitoba, including $20,000 for a drill hall at Brandon; $15,000 for a building at Selkirk; $15,000 for the Virden drill hall; $62,000 for the immigration building; $15,150 for a military magazine and $300,000 for a post office, all at Winnipeg; $255,500 for buildings in the Northwest Territory, including $40,000 for horse barracks at Srathcona, $40,000 to enlarge examining warehouse and post office at Calgary, $33,000 for a jail at Edmonton, $15,000 for public building at Medicine Hat, $20,000 for public building at Moose Jaw, $20,000 for a post office and custom house at Regina; $133,000 for British Columbia, including $100,000 toward a $450,000 public building at Vancouver.

BUSINESS BUILDINGS.

Notes Arranged Alphabetically by States.

Montgomery, Ala.—Plans are being prepared for a $50,000 warehouse which is to be erected in N. Montgomery for the Roman Cotton Co.

Ft. Logan H. Roots, Ark.—Bids are wanted Mar. 18 for installing plumbing, hot water heating and electric wiring in brick administration building at this post. R. R. Stevens, Ch. Q. M., San Antonio, Tex.

Clarksville, Ark.—It is reported that bids are wanted Mar. 15 for erecting hotel for Clarksville Hotel Co. A. N. Ragon, Secy.

Chico, Cal.—It is reported that Stone & Smith, of San Francisco, are preparing plans for an opera house and hall which is to be erected by the Order of Elks, at a cost of $50,000.

San Jose, Cal.—A committee has been appointed of which J. D. Radford is a member, to have charge of the project of erecting a building for the Y. M. C. A., to cost about $60,000.

Los Angeles, Cal.—A. F. Rosenheim, Hellman Bldg., it is reported, has prepared plans for the 7-story steel, brick and stone theater and office building which the Majestic Theater Co. (Oliver Morosco, Pres.) will erect on Bway. and 6th St. Probable cost, $300,000.

Denver, Colo.—It is reported that the Barth Bldg. is to be remodeled at a cost of $40,000. Wm. R. Barth, owner.

J. Foster Symes, it is reported, has announced that an 8-story fireproof brick and stone store and office building will be erected to replace the structure which was recently destroyed by fire. The cost to be about $500,000.

B. F. Woodward, it is stated, has purchased a site on Stout St., and will erect a store and apartment building to cost $20,000.

Hartford, Conn.—The Hartford Investment Co., it is stated, has filed articles of incorporation for the purpose of taking over the Batterson property and remodeling the building into a modern hotel. Plans have been prepared by Bayley & Goodrich, 78½ Church St., and provide for an expenditure of about $500,000. Earl D. Church is Secy. of the company.

Tifton, Ga.—The erection of a hotel to replace the structure destroyed by fire is reported under consideration. Probable cost, $60,000. Irvine Myers may be able to give further information.

Springfield, Ill.—The Illinois United Mine Workers, it is reported, are contemplating the erection of a building in this city to cost $30,000.

Kankakee, Ill.—The members of the Benevolent and Protective Order of Elks, it is reported, are contemplating the erection of a building to cost, including ground, about $20,000.

Chicago, Ill.—It is stated that bids will be received until Mar. 20 for constructing the superstructure of a 3-story and attic bank building to be erected at LaSalle and Monroe Sts. for the Northern Trust Co., 217 LaSalle St. Frost & Granger, Archts., 184 LaSalle St.

Indianapolis, Ind.—The members of the Marion Club, it is reported, have decided to erect a club house, at a cost of $50,000.

Seth M. Richcreek, it is stated, has ordered plans prepared for a 6-story office building, to be erected at 106 N. Delaware St., at an estimated cost of $40,000.

Evansville, Ind.—The Evansville Business Assoc., it is reported, is interested in the erection of a wharf warehouse this summer, estimated to cost $80,000.

Des Moines, Ia.—It is reported that Proudfoot & Bird, Crocker Bldg., are preparing plans for a warehouse to be erected by Younker Bros. at 9th and Vine Sts. It is to be of brick, either 4 or 5 stories high, 66x132 ft.

Hugh C. Pritchard, it is reported, is having plans prepared by Proudfoot & Bird, Crocker Bldg., for a 3-story store and apartment building which he intends erecting at W. 8th and Walnut Sts.

It is stated that the officials of the Minneapolis & St. Louis R. R. (W. D. Wheeler, Div. Engr., Minneapolis, Minn.), are contemplating improvements in this city which will include the building of new terminals, the erection of a freight house and round house improvements, etc.

Sioux City, Ia.—Davidson Bros. Co., it is reported, has commissioned Geo. W. Burkhead, Iowa Savings Bank Bldg., to prepare plans for improvements which they propose making to their store building; the cost to be about $20,000.

P. N. Myers, Gen. Mgr. of the Wright, Barrett & Stillwell Co., it is reported, has announced that his company contemplates erecting a warehouse in this city.

The Simmons Hardware Co. and Haley & Lang Co. will construct a 5-story block on Water and 4th Sts.; estimated cost, $150,000. Gordon, Tracy & Swartwout, Archts.

**Lawrence, Kan.*—W. Coleman, Secy. Y. M. C. A., writes that the contract for erecting a Y. M. C. A. building (bids opened Feb. 28) has been awarded to W. R. Carter, of Lawrence, for $19,305. Greabor Bros., of Lawrence, secured the contract for plumbing and heating same for $4,000.

Arkansas City, Kan.—The Atchison, Topeka & Santa Fe R. R. Co., it is stated, will erect an office building here to cost $20,000. W. B. Storey, Ch. Engr., Topeka, Kan.

**Paducah, Ky.*—The contract to erect the building at 2d and Jefferson Sts. for Friedman, Keiler & Co., it is reported, has been awarded to Wm. Karnes, of Paducah, at about $30,000.

New Orleans, La.—Emile Weil, 219 Carondelet St., and Stone Bros., 818 Common St. (associated), have been engaged to prepare plans for the auditorium which the Y. M. Hebrew Assoc. contemplates erecting on St. Charles Ave.

*Swift & Co., it is reported, have received the contract to erect elevator E. for the Illinois Central R. R. Co., to replace the one which was destroyed by fire recently. The approximate cost is reported to be about $300,000.

New Orleans, La.—Abe Meyer, according to reports, will erect for Jos. Levy & Bros., a 6-story building at Magazine and Common Sts.

Bangor, Me.—Snow & Nealley are to erect a 4-story brick block on Broad St. this spring, to cost $40,000. W. E. Mansur, Archt., 6 Broad St.

Baltimore, Md.—It is reported that John S. Bridges has commissioned Geo. N. Mackenzie, 3d, to prepare plans for a 7-story building to be erected at 22 W. Baltimore St.

*A building permit has been granted to Jas. E. Ingram to erect a group of 9 warehouses at Hanover and Lombard Sts., to cost $150,000. Ellicott & Emmart, 323 N. Charles St., are the archts., and Wells Bros. Co., N. Y. City, are the builders; also to the Consolidated Gas Co., to erect a 5-story brick office building at Lexington and Liberty Sts., to cost $50,000. Sperry, York & Sawyer, Builders Exchange, are the archts., and J. & S. H. Lampere the builders.

*The Baltimore Distilling Co. has applied for a permit to erect a 1-story brick structure on Carey St., near Warner, to cost $25,000. Chas. A. Sieling, 342 N. Calvert St., is the builder.

The Aerie No. 59, Fraternal Order of Eagles, it is stated, has selected a committee to have charge of the receiving of plans for a club house to cost about $100,000. Fredk. C. Schanberger is a member of the com.

**Boston, Mass.*—The New England Trust Co. has filed plans with the Bldg. Comr. for a new bank building, to be erected at Milk and Devonshire Sts. The building will be steel-frame, fireproof, 3 stories high 96x53 ft., and will be faced with marble and brick. Contractors, Norcross Bros., 73 Tremont St.; architects, McKim, Mead & White, New York, N. Y.

**Nantasket, Mass.*—Louis Coderre, of Worcester, it is stated, has received the contract to erect a building at Nantasket Beach which is to cost $75,000.

Battle Creek, Mich.—The officials of the Grand Trunk R. R. Co., it is stated, intend erecting a freight house here to cost about $32,000. Jos. Hobson, Ch. Engr., Montreal, Que.

Minneapolis, Minn.—F. D. Orff, 613 Lumber Exchange, it is reported, has prepared plans for a 3-story brick and stone lodge building which the Arcana Lodge No. 187 will erect on 25th Ave. at a cost of $30,000. D. C. Brown is a member of the Com. having the erection of the building in charge.

Lowell A. Lamoreaux, Lumber Exchange, it is stated, is preparing plans for a 3-story brick 50x125 ft. building which the Bintliff Mfg. Co. will erect on Central Ave. and 7th St., at a cost of $22,000.

W. J. Keith will erect a 6-story fireproof apartment hotel at 1700 Hennepin Ave., to cost $200,000.

The Washburn Crosby Milling Co. is stated to have decided to erect a 5-story warehouse and machine shop at Canal and 6th Ave., S. St., to cost $20,000.

J. E. Nason is stated to have prepared plans for a 2-story brick factory for Geo. A. Fisher, to be erected at 221 N. 1st St., to cost $20,000.

W. M. Kenyon, Guaranty Bldg., is stated to have prepared plans for an addition to the machine shop of the Minneapolis, St. Paul & Sault Ste. Marie Ry. Co., at 24th Ave., N. E., to cost $40,000.

St. Paul, Minn.—The Mounds Park sanatorium Assoc., it is stated, is contemplating the erection of a sanatorium for chronic and nervous diseases, to be erected on Thorne and Hiawatha Sts. Dr. R. O. Earl may be able to give further information.

The St. Paul Turnverein, it is stated, is considering the erection of a building to cost about $40,000.

Stillwater, Minn.—F. W. Kinney, of Minneapolis, Minn., it is reported, will soon have plans ready for bids for erecting the First Natl. Bank Bldg., the cost to be about $30,000.

St. Louis Mo.—It is reported that Russeli A. Richardson is having plans prepared for a 3-story store and office building, 50x175 ft. Probable cost, $50,000. J. C. Nulsen, through his agents, Beckwith Bros. & Co., will erect a 3-story brick structure, 50x135 ft., and F. De Wolf is also having plans drawn for a 2-story brick store and office building to be erected on Collinsville Ave.; cost, $15,000. These three buildings are to replace structures recently destroyed by fire. Beckwith Bros. are having plans drawn for a 3-story store, office and hall building, to be erected at 124 Collinsville Ave.

*The Conzelman-Crunden Realty Co. has secured a permit for a 6-story warehouse to be erected at 113-137 Gratiot St. Cost, $154,000. Ed. Ward, Benoist Bldg., is the builder. Mauran, Russell & Garden, 721 Olive St., are the archts.

A permit has been granted to John Weiseri to erect a 5-story factory at 1120 to 1126 S. 6th St., to cost $24,000.

Barnett, Haynes & Barnett, Olive and 9th Sts., are preparing plans for a 5-story fireproof building which Martin Shaughnessy will erect at 826 N. B'way, at a cost of $25,000.

**Omaha, Neb.*—The Capitol City Brick & Pipe Co., of Des Moines, Ia., it is reported, has received the contract for the masonry and mill construction work on the warehouse which is to be erected for the American Radiator Co., the contract amounting to about $50,000.

Manchester, N. H.—It is reported that the main car barns of the Manchester Traction Co. have been destroyed by fire.

New York, N. Y.—Neville & Bagge, 217 W. 125th St., it is reported, are the archts. for a 10-story office building which is to be erected at the junction of Third, Westchester, Bergen and Willis Aves. and 149th St., and is to include a theater.

Toledo, O.—It is reported that LaSalle & Roch will erect a 4-story addition to their store, at a cost of $40,000.

Eaton, O.—The Waverly Lodge K. of P., it is stated, will erect a temple this summer, to cost $20,000. C. F. Brooks, Chm. Bldg. Com.

Hamilton, O.—It is reported that the Order of Elks is contemplating the erection of a 4-story building on S. Monument Ave., estimated to cost $35,000.

**Coshocton, O.*—R. H. Evans & Co., of Zanesville, it is reported, have received the contract to erect a building for the Eldridge-Higgins Co., to cost about $16,000.

Dayton, O.—W. B. Earnshaw, Pres. Dayton Malleable Iron Co., writes that it is proposed to erect a 2-story warehouse 100x150 ft.

Albert D. Wickersham, of Dayton View, it is reported, will erect a 6-story brick and stone store and office building on W. 3d St., to cost $200,000.

Cincinnati, O.—G. B. Nicholson, of Cincinnati, Ch. Engr. New Orleans & Texas Pacific Ry. Co., writes that the proposed terminal work will cost about $200,000. Bids will be opened on Apr. 3 by the Trustees of the Cincinnati Southern Ry. (Stanley Ferguson, Secy., 57 Ingalls Bldg.) for a freight terminal consisting of a 2-story office building and in-bound freight house 42x1,100 ft .and out-bound freight house 25x1,100 ft., concrete construction.

Jos. Steinkamp & Bro., Mercantile Library Bldg., it is stated are preparing plans for a 7-story brick building which is to be erected at Longworth and Race Sts., for Greg G. Wright & Son, and to cost about $30,000.

Oklahoma City, Okla. Ter.—The McCord-Collins Mercantile Co., it is stated, is contemplating the erection of a 3-story and basement brick building on First St., to cost $40,000.

Watonga, Okla. Ter.—Bids will be received Mar. 15 by J. C. Fisher, at Okeene, for erecting a 3-story 50x100-ft. brick hotel.

Items marked thus give the names of parties awarded contracts.

Allegheny, Pa.—The Order of Elks, Aerie No. 827, it is reported, is contemplating the erection of a clubhouse here to cost about $20,000.

New Kensington, Pa.—The erection of a Y. M. C. A. building to cost about $22,000 is reported under consideration.

Philadelphia, Pa.—John W. Emery has been granted a permit to erect a 6-story brick factory at 12th and Race Sts., to cost $30,000. A. Whitehead, 1624 Latimer St., has also been granted a permit to make alterations to store at 12th and Chestnut Sts.; cost, $20,000.

The Girard Trust Co., it is reported, is contemplating the erection of a 1-story building at Broad and Chestnut Sts., estimated to cost about $1,000,000. Allen Evans, of Philadelphia, and McKim, Mead & White, of N. Y. City, are reported to be the archts.

*J. E. & A. L. Pennock, Land Title Bldg., it is reported, have received the contract to erect an addition to the building of the Fidelity Trust Co., at Orianna and Chestnut Sts., to cost $102,492.

Narragansett, R. I.—Louis Sherry, it is reported, is contemplating the erection of a casino here to cost about $50,000.

Darlington, S. C.—The R. R. Comrs. and W. N. Royall, of Wilmington, Gen. Supt. of the Atlantic Coast Line R. R., it is reported, are conferring with the business men regarding the erection of a new brick passenger station.

Nashville, Tenn.—Marshall & Bruse Co., it is reported, intend erecting a publishing house on 4th Ave., N., to cost about $60.000.

Knoxville, Tenn.—It is reported that the Knoxville Banking Co. has purchased a site at Gay St. and Clinch Ave., and is contemplating the erection of a building 10 or 12 stories high. Mayer Gass is Pres. of the Bank.

Houston, Tex.—Plans submitted by Cook & Co., Klam Bldg., it is stated, have been accepted for remodeling the building at Fannin St. and Prairie Ave., which is to be occupied by the Waddell Furniture Co., and the cost of improvements is reported to be about $40,000.

**Bellingham, Wash.*—Booker & Campbell, it is stated, have received the contract to erect the Y. M. C. A. building at about $20,000.

Spokane, Wash.—John K. Dow, 518 Peyton Bldg., it is reported, is preparing plans for a 4-story and basement Y. M. C. A. building which is to be erected at Lincoln St. and First Ave. at a probable cost of $125,000.

Seattle, Wash.—W. P. McElwain, it is stated, has commissioned W. P. White, Washington Bldg., to prepare plans for a 3-story brick hotel which is to be erected on 6th Ave. and Madison St., at a cost of $25,000.

New Martinsville, W. Va.—It is stated that bids will be received until Mar. 25 by the Masonic Temple Assoc. (F. W. Clark, Pres.), for erecting a 4-story Masonic Temple, 50x118 ft.

Prado, Havana.—It is reported that Jules Hurtig, of Hurtig & Seamon, theatrical managers, have purchased a site on the Prado, Havana for a $1,000,000 theatre and hotel for that city. Mr. Hurtig and A. L. Wilbur, of Stair & Wilbur, are the promoters for the theatre and hotel.

Brandon, Man., Bids will be received by A. E. McKenzie, Secy: Bldg. Com. Y. M. C. A., on Mar. 20 for the erection of a 4-story building, as advertised in The Engineering Record.

NEW YORK, N. Y.

80 Chrystie St, 6-story br and stone store and tenmt; c, $32,000; o, Gordon, Levy & Co; a, Edward A. Meyers.

308 E 33d St, 2 6-story br and stone stores and tenemts; total c, $80,000; o, Rosenblum & Cohen; a, Sass & Smallheiser.

312 W 143d St, 4-story br and stone stable and loft bldg; c, $20,000; o, Mrs. Lizzie D Gerleit; a, Frederick C Browne.

8th Ave and 147th St, 3 5-story br and stone store and tenemts; total c, $134,000; o, Fleischman Realty Co; a, Geo F. Pelham.

3 E 40th St, 2-story br and stone extension to 4-story art bldg; c, $30,000; o, Cottier & Co; a, Joseph H Taft.

116th St and Madison Ave, 2 6-story br and stone stores and tenemts; total c, $110,000; o, Tischler & Bornstein; a, Geo F Pelham.

1614 B'way, alterations to 3-story store and loft bldg; c, $15,000; o, Century Realty Co; a, W E Young.

321 W 44th St, 6-story br and stone tenemt; c, $50,000; o, Julius Weinstein; a, Bernstein & Bernstein.

126 W 42d St, 8-story br and stone stores and loft bldg; c, $100,000; o, C C Shayne; a, Albert S. Gottlieb.

617 47th St, 3-story br and stone loft bldg; c, $30,000; o, Edward Beinhauer; a, John H Knubel.

607 W 50th St, 6-story br and stone factory; c, $50,000; o, trustees for Jacob Astor; a, W A Boring.

363 5th Ave, 8-story br and stone store bldg; c, $2,500,000; o, B Altman; a, Trowbridge & Livingston.

98 5th Ave, 15-story br and stone store and loft bldg; c. $300,000; o, Jacob Rothschild; a, Albert Gottlieb.

12th Ave and 30th St, 5-story br and stone loft bldg; c, $20,000; o, John Jordan; a, Thos H Styles.

Westchester Ave and Dawson St, 2 1-story br stores and dwells; c, $30,000; o, Adams Realty Co; a, Neville & Bagge.

CHURCHES AND DWELLINGS.

Notes Arranged Alphabetically by States.

New Haven, Conn.—Frank R. Comstock, it is reported, has completed plans for an edifice which the First Presbyterian Church intends erecting on Elm St., at a cost of about $60,000. John Dalbleish is Chmn. Bldg. Com.

**Washington, D. C.*—B. Frank Meyers, Bond Bldg., it is stated, is the archt. for a 7-story fireproof apartment building which is to be erected at 1808 I St., N. W., for Tottel & Ward. Thompson-Starrett, of N. Y. City, are the builders.

Augusta, Ga.—The congregation of the St. John's Methodist Church, it is stated, has decided to erect a new Sunday-school building and parsonage to cost about $25,000.

Springfield, Ill.—Plans are being prepared, according to reports, for a 3-story apartment house which is to be erected by H. T. Loper, at a cost of $25,000. J. Henry Conway may be able to give further information.

**Indianapolis, Ind.*—The J. H. Billingsley Co., 1405 Bates St., it is stated, has secured the contract for the stone work on the First Baptist Church at $25,000.

Spencer, Ia.—F. W. Kinney, of Minneapolis, Minn., it is stated, is preparing plans for a $45,000 residence which is to be erected for C. H. Martin.

Clarkesville, Ia.—It is reported that bids are wanted Mar. 21 for erecting a M. E. Church. G. Walland, Sec. Bldg. Co.

Des Moines, Ia.—Hallett & Rawson, 615 Walnut St., it is stated, have prepared plans for a 3-story 100x132-ft. apartment house to be erected at a cost of $50,000.

Lincoln, Kan.—It is stated that bids are wanted Mar. 25 for erecting a R. C. Church. Jos. Marshall, Archt., 115 W. 5th St., Topeka.

Owensboro, Ky.—B. B. Davis, of Louisville, it is reported, has completed plans for a $20,000 edifice for the Settle Chapel Methodist Church. Address Pastor.

New Orleans, La.—Plans have been completed for a new brick and stone edifice which is to be erected on St. Charles St. for the First Baptist Church at a cost of about $40,000. Rev. C. V. Edwards, Pastor.

Kalamazoo, Mich.—H. C. Tanis, of Kalamazoo, has prepared plans for a 3-story and basement apartment house which is to be erected at South and West Sts. for A. J. Patterson at a cost of $40,000.

Minneapolis, Minn.—Harry W. Jones, 916 Lumber Exchange, it is stated, is preparing plans for a brick residence which is to be erected at Park Ave. and 25th St., for Chas. W. Sexton; cost, $25,000.

Joplin, Mo.—Bids will be received Mar. 20 by the Bd. Trus. (J. W. King, Secy.) for erecting a R. C. Church. Austin Allen, Archt., Busch Bldg.

Syracuse, N. Y.—Walter McMullin and Geo. C. Cook, as trus. of the Lynch estate, it is stated, have accepted plans prepared by M. C. Conway, 112 E. Jefferson St. for an apartment house which is to be erected at James and North Sts., at a cost of $350,000.

It is reported that the congregation of the Holy Trinity Catholic Church is contemplating the erection of a new edifice. Rev. J. Reuland, Pastor.

Toledo, O.—Geo. S. Mills, Gardner Bldg., it is stated, has prepared plans for a 3-story brick flat which is to be erected for Irving Squire at Washington and Ontario Sts., at a cost of $25,000.

Dayton, O.—C. I. Williams, Callahan Blk., it is stated, is preparing plans for an apartment house which is to be erected on N. Main St., cost about $100,000, and to be known as the Belleview.

Philadelphia, Pa.—It is reported that Fred. A. Havens & Co. have been granted a permit to erect a 3-story apartment house in Allen lane and Germantown Ave., for Miss L. Watson, to cost $25,000.

**Phoenixville, Pa.*—It is reported that the contract for the stone work on the R. C. Church has been awarded to P. J. McCormick & Son, of W. Chester. The estimated cost of the church is $60,000.

**Milwaukee, Wis.*—John Schramka, 1001 Bremen St., it is stated, has the contract to erect an apartment house for Louis Auer & Son at 14th and Prairie Sts., to cost $27,000.

H. Brielmaier & Son, it is reported, has completed plans for a new edifice which is to be erected by the St. Laurentius congregation at 21st Ave. and Orchard St., to be of brick and stone and cost about $45,000. Rev. L. Bastle, Pastor.

Eau Clair, Wis.—It is stated that Harry W. Jones, Minneapolis, Minn., is preparing plans for a residence to be erected for J. H. Barber, at a cost of $15,000.

NEW YORK, N. Y.

19 E 37th St, 5-story br and stone dwell; c, $60,000; o, Chas H Ditson; a, C P H Gilbert.

104th St and Park Ave, 6-story br and stone tenemt; c, $30,000; o, Hyman Romm; a, Maximilian Zipkes.

Park Ave and 104th St, 2 6-story br and stone tenemts; total c, $80,000; o, Kayfetz & Flam; a, Bernstein & Bernstein.

111th St and B'way, 2 6-story br and stone tenemts; total c, $200,000; o, Markenfield Constr Co; a, Lawlor & Haase.

117th St and Lenox Ave, 3 6-story br and stone tenemts; total c, $145,000; o, Lewine & Danis; a, Levitan & Fischer.

117th St and Lenox Ave, 6-story br and stone tenemts, total c, $130,000; o, Irving Judis; a, Levitan & Fischer.

143d St and Lenox Ave, 3 6-story br and stone tenemts; total c, $120,000; o, Halprin, Sussman & Sax; a, Rouse & Sloan.

147th St and 7th Ave, 3 5-story br and stone tenemts; total c, $102,000; o, Fleischman Realty Co; a, Geo F Pelham.

151st St and Macombs Dam Road, 3 6-story br and stone tenemts; total c, $125,000; o, Miller & Mofsenson; a, Bernstein & Bernstein.

148th St and 7th Ave, 2 5-story br and stone tenemts; total c, $80,000; o, Isaac and Henry Mayer; a, Neville & Bagge.

139th St and St Ann's Ave, 6 5-story br tenemts; total c, $150,000; o, Moses Arndtstein; a, N J Garvin.

Ft Washington Rd and 181st St, alteration to br and stone dwell; c, $90,000; o, C K G Billings; a, Guy Lowell.

Wadsworth Ave and 178th St, 5-story br and stone tenemt; c, $40,000; o, John D. Walton; a, Neville & Bagge.

135th St and Willow Ave, 2 5-story br tenemts; total c, $55,000; o, Martin Tully; a, Harry T Howell.

984 5th Ave, 2 6-story br and stone dwell; total c, $100,000; o, Isaac V. Brokau; a, C F Rose.

7th Ave and 133d St, 6-story br and stone tenemt; c, $26,500; o, Rockmore & Gleich; a, Geo F Pelham.

156th St and Melrose Ave, 2 6-story br tenemt; total c, $85,000; o, Bulman & McWhirter; a, M J Garvin.

80 Stanton St, alterations to 5-story br and stone tenemt; c, $15,000; o, L M Boehmann; a, O Reissmann.

607 Hudson St, 6-story br and stone hotel; c, $150,000; o, Wm R H Martin; a, Ralph S Townsend.

460 Washington St, 2-story br and stone warehouse; c, $30,000; o, Union Draw Steel Co; a, Wm A Boring.

140th St and Brook Ave, 8 5-story br tenemts; total c, $304,000; o, McKinley Realty & Constr Co; a, John Hauser.

145th St and Willis Ave, 2 5-story br tenemt; total c, $70,000; o, John Brown; a, Sass & Smallheiser.

149th St and Brook Ave, 2 6-story br tenemts; total c, $80,000; o, John Brown; a, Sass & Smallheiser.

158th St and Union Ave, 5-story br tenemt; c, $45,000; o, Max Sternberg; a, Jacob Goldner.

163d St and Melrose Ave, 2 5-story br tenemts; total c, $55,000; o, Moorehead Realty Constr. Co; a, Harry T Howell.

187th St and Belmont Ave, 4-story br tenemt; c, $18,000; o, Checchena Carucci; a, Neville & Bagge.

Clinton Ave and Jefferson Pl, 2 5-story br tenemts; total c, $80,000; o, Jacob Jung; a, Chas Stegmayer.

Forest Ave and 166th St, 2 5-story br tenemts; total c, $100,000; o, Thos J Quinn; a, Harry T Howell.

Webster Ave and 171st St, 2 5-story br tenemts; total c, $80,000; o, Harres Ratner; a, John Hauser.

247 W 15th St, alterations to 2 5-story br and stone tenemts; c, $25,000; o, Harris Bernstein; a, Sass & Smallheiser.

SCHOOLS.

Notes Arranged Alphabetically by States.

Little Rock, Ark.—The House has passed a bill authorizing the erection of a State Reform School, but reducing the appropriation from $50,000 to $30,000.

Little Rock, Ark.—It is reported that bids are wanted Mar. 20 for installing steam boilers, engine, pump and other appurtenances, connected therewith, in Little Rock High School. L. W. Cherry, Chmn. Bldg. Com.

**Alhambra, Cal.*—F. E. Williams, Clk. City High School, Bd. of Trus., writes that the contract for erecting a high school (bids opened Feb. 18) has been awarded to J. F. Hall, of Alhambra, for $34,500.

Berkeley, Cal.—The citizens voted Feb. 25 to issue $150,000 bonds to be used for the purchase of school sites, and the erection of new schools and additions to present school buildings.

Sacramento, Cal.—The erection of a State Normal School at a cost of $150,000 is reported under consideration.

Golden, Colo.—Simon Guggenheim, it is stated, has given $50,000 to the Colorado School of Mines, with which it is proposed erecting a new administration building, to be known as Simon Guggenheim Hall.

Hartford, Conn.—The Special Bldg. Com. has been authorized to procure plans and specifications for either an addition to the present school building on Albany Ave. or for an entire new building.

Storrs, Conn.—It is reported that the following bids were received on Feb. 28 by the State Treas. at Hartford, for erecting a dormitory at the Conn. Agricultural College here: H. Wales Lines Co., Meriden, $64,623; D'Esopo Brothers, Hartford, $76,463; The B. H. Hibbard Co., N. Britain, $63,975; The C. F. Wooding Co., Wallingford, $72,993; Central Building Co., Worcester, $76,450; A. N. Carpenter, Norwich, $66,000; Frank B. Gilbreth, Boston, $75,894; Ambrose B. Stannard, N. Y. City, $72,000; The J. C. Walsh Co., Providence, $63,575; The Torrington Building Co., Torrington, $70,500; Fissell & Wagner, N. Y. City, $85,271; Tracy Brothers, Waterbury, $68,500; Peck, McWilliams & Co., Norwich, $63,425.

Galesburg, Ill.—The Bd. of Educ. has decided to build a $20,000 heating plant to heat the high school, the central primary and the Churchill Schools.

Chicago, Ill.—The Trus. of the Univ. of Chicago, it is reported, are contemplating the enlarging of the Univ. at a cost of between $5,000,000 and $10,000,000, the work to include the erection of 12 dormitories.

Tipton, Ind.—The School Bd., it is stated, has purchased a site and will erect a $40,000 high school.

South Bend, Ind.—Freyermuth & Maurer, 138 N. Michigan St., are stated to have completed plans for a 13-room school, to be erected in the Muessel addition to the city: total cost, including equipment, will be $50,000.

Indianapolis, Ind.—Bids will be
until Mar. 28 by the Bd. of School
for erecting a school on King Ave.,
ville, Indianapolis, and for remode
building at same place. Rubush &
Archts., Fitzgerald Bldg.; John E.
Bus. Dir.

Terre Haute, Ind.—The Legislat
appropriated $50,000 for the erecti
dormitory at the Normal School here.

Pella, Ia.—The Trus. of the Centr
of Iowa, it is stated, have announce
building is to be erected on the cam
summer to cost $20,000.

Norway, Ia.—It is reported that
wanted Mar. 25 for erecting St.
parochial school. Dieman & Fiske,
Cedar Rapids.

Wichita, Kan.—Reports state that
College has received a donation of
from Andrew Carnegie to erect a libra

Shreveport, La.—N. S. Allen, of Sh
it is reported, has completed plans fo
000 school, to be erected in Texarkan

Bienville, La.—It is reported that
000 school is to be erected here.

Baltimore, Md.—The following are
to be the bids received Mar. 1 for ere
Eastern High School on Bway. an
Ave.: D. W. & G. H. Thomas, of B
$311,900 (awarded contract); Cram
$314,600; Charles McCaul Co., $
Henry S. Rippel, $335,349; Henry
Sons Co., $339,000; Charles L. Stoc
$342,800; William Steele & Sons, $
and M. C. Davis, $346,386.

Springfield, Mass.—The Bd. of A
has passed the order to fireproof the T
High School at a cost of $20,000.

Amherst, Mass.—Plans have been c
by Boring & Tilton, of N. Y. City,
addition which is to be erected to th
Gymnasium at Amherst College.

Ashburnham, Mass.—The citizens vo
6 to accept the gift of $20,000 from M
Adams, a lawyer of Boston, to be
the erection of a grammar school.

Boston, Mass.—The Trus. of the
Fund, and Andrew Carnegie, it is
have reached an agreement whereby
is to be given by Andrew Carnegie tow
establishment of a building here si
the Cooper Institute in N. Y. City.
will be $800,000 available for the pro

New Bedford, Mass.—Bids will be
Mar. 13 by Wm. E. Hatch, Chmn. Bld
for erecting an addition to New Bedf
tile School. Probable cost, $20,000.
Smith. Archt.

Oxford, Mass.—A. A. Barker, of W
it is stated, has prepared plans for
high school which it is proposed ere
a cost, including ventilating, heating,
ing, etc., of about $19,000.

**Appleton, Minn.*—Downs & Eads,
208 N. Y. Life Bldg., Minneapolis, wr
John Carlson & Co., of Ortonville,
cured the contract for erecting a hig
at Appleton, for $10,328, and Pond &
of Minneapolis, the contract for heati
at $2,010 (bids opened Mar. 1).

Minneapolis, Minn.—The Univ.
Assoc., it is stated, has commenced
definite plans for the erection of a
near the campus on University Ave.,
to cost $20,000.

Rushford, Minn.—F. W. Kinney, of
apolis, it is reported, is preparing pla
high school to be erected here at a
$35,000.

Manchester, N. H.—The School Bo
recommended to City Council an app
tion of $45,000, for a new school.

Cape May, N. J.—The citizens on
voted in favor of erecting a school at
of $13,000. E. C. Hewitt, Dist. Clk.

Princeton, N. J.—Pres. Woodrow W
is stated, has announced that a buil
be used as a recitation hall is to be
at Princeton Univ. at a probable cost o
000.

**New York, N. Y.*—The following
bids opened Mar. 6 by C. B. J. Snyde
School Bldgs., for general construc
School No. 65, Boro. of Manhattan: G
debrand, $419,600; Richard E. Hen
4-5 Court Sq., Bklyn., $408,000 (awar
tract); Waters & O'Connell, $454,000
Sullivan, $434,000; P. J. Walsh, $4
Thos. Cockerill & Son, $418,500, an
Brennan, $419,000.

*Bids were opened same time and
follows for sanitary work and gas fitti
De Witt Clinton High School, Ma
Boro.; (*b*) School 41, Bronx Boro.; J
ley, *a*, $48,431. W. H. Spelman, 112
St., *a*, $45,411 (awarded contract).
Nally, *a*, $51,000; *b*, $7,987. Ross
Bracken Co., *a*, $82,950. Wm. C. Orn
$54,000; *b*, $8,300. Jere J. Deady, *b*,
(awarded contract). Frank J. Fee, *b*,

*Bids were opened same time and p
installing ventilating and heating app
(*a*) Public School 15; (VE) School 1
in Manhattan Boro.: Frank Dobson,
712; *b*, $20,800. Evans, Almirall & C
Water St., *a*, $17,829; *b*, $20,700. W
vany, *a*, $20,242; *b*, $20,400. Harry
a, $21,847. E. Rutzler Co., *a*, $18,830
N. Tobin, *a*, $19,981. Geo. A. Sut
Wooster St., *a*, $18,395; *b*, $21,374.
& Chambers, 50 E. 20th St., *a*, $19,
$20,400 (awarded contract).

*Springsted & Adamson, 434 E. 10
has secured the contract for the ere
outside iron stairs on School 56, Ma
Boro. (bids opened Mar. 6) for $3,178.

****Items marked thus give the names of parties awarded contracts.***

ster, N. Y.—Separate bids will be ar 14 by John W. Diehl, Pres. Bd. erecting a primary school on S. , and an addition to Brooksville hool on Rectory St. and Locust

N. Y.—It is stated that bids will until Mar. 15 by Pierce & Bick- s., 120 Lake St., Elmira, for erect- school. Bids on ventilating, heat- umbing to be submitted separately.

Y.—Bids will be received by E. L. Treas. Cornell Univ., on Apr. 3 for on of the N. Y. State College of e, as advertised in The Engineering

V. Y.—It is stated that bids will be until Mar. 17 by Frank A. Hill, Educ., for repairing and remodeling n Academy and erecting an addi- to. Edw. Ball, Archt., Glens Falls.

alls, N. Y.—The following are re- be the bids received Feb. 23 for school (bidders of Sandy Hill un- wise stated): Jas. McCarty, $21,- s. Sanderspree, Ft. Edward, $20,- Jas. Gibson, $22,295; John Grant, and Gibson Bros., $20,569.

, N. Y.—The Bd. of Aldermen has he report of the Finance Com. au- the issue of $300,000 bonds for rposes.

V. Dak.—It is reported that bids are lar. 16 for erecting 2 brick schools in N 80. S. H. Crothert, Clk. School Bd.

, O.—It is reported that bids are Apr. 1 for erecting two schools in n Township. H. A. Schabon, Clk. d.

Liverpool, O.—Walter B. Hill, Clk. ., writes that it is proposed to erect hool, to cost $75,000.

ind, O.—Bids will be received Mar. e Bd. Educ., for furnishing material ting an annex to Barkwill school, in- nason, cut stone, carpenter and sheet ork, iron and steel, roofing, ventilat- ting, plumbing, gas-fitting, sewers, ng, cement and granolithic floors, wiring, etc.; bids will also be re- pr. 3 for furnishing material and re- plumbing in Central High School; r labor and material for each school bmitted separately. Chas. Orr., Dir. ls, Rose Bldg.

rk, O.—Bids will be received Mar. 27 Bd. Educ., for erecting a 12-room n Woodside school site; bids on labor, l and heating to be submitted separ- Wilbur T. Mills, Archt., 233 N. High umbus; D. M. Keller, Clk.

ie, Okla. Ter.—The House has passed lowing bills: $50,000 for an addi- building at the Alva normal school, for girls' dormitory at the State ity, at Langston, $70,000 for addi- uildings at the preparatory university, for Morrill hall at the A. and M. col- Stillwater, and $5,000 for a heating t the Weatherford normal.

yra, Pa.—Harvey T. Hauer, of Leb- t is stated, has prepared plans for a hool which is to be erected here this

ladelphia, Pa.—John McShain, 631 No. t., has received a permit to erect a 4- brick parochial school 60x160 ft. for ul's R. C. Church on Montrose and 9th Cost, $61,800.

nderson & Co., 1221 Arch St., it is have secured a permit to erect a at 11th and Venango Sts. to cost $80,-

following bids are reported to have eceived Mar. 7 by the Bd. of Educ.'s on Property, for erecting the Southern l Training School: Cramp & Co., $361,- Edward F. Fonder Company, $370,000; rson & Co., Ltd., $371,087; David Peo- $372,861; Metzger & Wells, $376,765; R. Wiggins & Co., $379,000; Thomas $398,000; W. Christy & Son, $418.000.

sburg, Pa.—Bids will be received until 21 by the Trus. Carnegie Technical ls, 313 6th Ave., for erecting the Tech- School.

ins Park, Pa.—Henderson & Co., of delphia, Pa., it is stated, submitted the bid on Mar 4 for erecting the high in Cheltenham Township, at about $65,-

xville, Tenn.—The Bd. of Educ. has mended that a 10-room school be d on the site of the Gratz Ave. bldg., a n addition to the 9th Ward school and a n addition to the Sevier School.

roit, Tex.—It is reported that the erec- f a school to cost $20,000 is under con- tion.

hmond, Va.—Competitive plans will be ed Apr. 17 by the Joint Subcommittee w High School Bldgs. (C. P. Walford, and Superv.) for a high school. Prob- ost, $300,000.

ttle, Wash.—The School Bd. has decided ve plans prepared for an 8-room school erected at 4th Ave., N., and Newton St., st complete $25,000.

. Stephen, 727 New York Blk., it is re- l, has filed plans for a school to be d at 1413 Summit Ave., at a cost of 00.

ooner, Wis.—Peter Kircher, of Hudson, reported, has received the contract to the high school at a cost of about $15,-

West Allis, Wis.—The citizens have voted in favor of issuing $30,000 bonds to erect a school.

**Watertown, Wis.*—Archts. Buemming & Dick, Pabst Bldg., Milwaukee, write that the contract fir erecting a dormitory at the Northwest Univ. at Watertown has been awarded to Peters & Stewart, of Janesville. According to press reports the building will cost $40,000.

Marathon, Wis.—It is reported that bids are wanted Mar. 24 for erecting a parochial school. Wm. Daniels, Secy. Bldg. Com.

Wauwatosa, Wis.—Wm. R. Nethercut, Chmn. Bd. Educ., writes that bids will be received Mar. 20 at the City Clerk's office for the erection of a high school, to cost $24,000. Architects Leenhouts & Guthrie, 102 Wisconsin St., Milwaukee.

Peterboro, Ont.—Bids will be received until Mar. 31 by W. G. Morrow, Secy. Bd. Educ., for erecting a Collegiate Institute Bldg. J. E. Belcher, Archt., Peterboro.

Galt, Ont.—Bids will be received until Mar. 15 (readvertisement), by Thos. Carscadden, Secy., for erecting a Collegiate Institute Bldg. Stewart & Witton, Archts., Hamilton.

STREET CLEANING AND GARBAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Boston, Mass.—Bids will be received Mar. 14 by Jas. Donovan, Supt. of Streets, for collection and removal of store dirt, house dirt and ashes in West Roxbury Dist.

Plainfield, N. J.—The House is reported to have passed a bill permitting this city to erect a crematory.

**Rochester, N. Y.*—The Bd. of Contract is reported to have awarded to Wm. Sours the contract for street sprinkling for 1 year, for $33,359.

Long Island City, L. I., N. Y.—Wm Nolan, 375 Fulton St., Brooklyn, submitted a bid of $24,950 to Jos. Cassidy, Pres. Queens Boro., on Mar. 6, for furnishing all material and labor and constructing and delivering a plant for the final disposition of garbage, rubbish and light refuse to be collected in the 4th Ward of Queens Boro.

NEW INDUSTRIAL PLANTS.

See also Business Buildings.

A charter has been applied for and $50,000 subscribed toward the erection of a cotton yarn mill at Acworth, Ga. Work will be commenced at once on the erection of the buildings. J. J. Northcutt is temporary secretary.

The Fawcus Machine Co., 2820-2828 Smallman St., Pittsburg, Pa., is preparing to increase its plant to about double its present capacity, which will involve additions to the present buildings and machinery. Some of the machinery has been ordered.

The Grantville, Ga., Hosiery Mills will let contracts at an early date for a 290x80-ft. yarn mill, to contain a power plant of about 300 h.p. capacity and 3,000 spindles, with provision for increasing the number of spindles to 5,000. Twenty-five additional knitting machines will be installed in the hosiery plant.

Jas. E. Fenner, Clarksville, Ga., is interested in the founding of a co-operative colony on a site of 655 acres on the Tallulah Falls R. R. It is proposed to erect a small knitting mill, sawmill, planing mill, grist mill, sugar mill and canning plant.

The Fitz Water Wheel Co., Hanover, Pa., is building a new plant, which will consist of a machine shop 120 ft. long, two buildings, 40x60 and 20 ft. square, respectively, an office building 20 ft. square and a 26x36-ft. pattern storehouse.

The Bowen-Jewell Co., Jewell, Ga., is in the market for cotton-mill machinery from pickers to looms.

Press reports state that bids will be opened March 18 for the erection of a 30,000-bu. elevator for the Farmers' Elevator Co., Springfield, Minn.

The Pope-Gosser China Co., Coshocton, O., will erect an 18½-ft. biscuit kiln, a double decorating kiln, a brick warehouse about 60x30 ft. in size, an additional biscuit warehouse and a brick structure enclosing the two kilns. This will increase the capacity of the plant about one-third.

The American Conduit Co., The Nasby, Toledo, O., contemplates erecting a plant and will require curving rolls, corrugating machines, punches, shears, etc., all to be directly driven from motors.

The Dana Mfg. Co., Cincinnati, O., maker of freezers, will erect a new plant in Norwood, O., which will include two 60x154-ft. buildings, an 85x154-ft. building, a 38x58-ft. building and a foundry, dimensions of which have not been decided. The power plant will be of the direct current generator type of probably 125 to 150 h.p. Bert L. Baldwin Co., Perin Bldg., Cincinnati, are the engineers in charge of the plant.

The Philadelphia Caramel Co., 1217-1227 Beach St., Philadelphia, Pa., will erect a 2-story, 265x180-ft. building in Camden, N. J. The power plant will consist of two 150-h.p. boilers and a 75-h.p. engine.

The Joseph Schneible Co., West and Wisconsin Sts., Indianapolis, Ind., is the contractor for the plants of the Capital City Brewing Co., Indianapolis, Ind., and the Consumers' Brewing Co., Ashtabula, O. The company desires information concerning interior equipment, iron, brick, roofing and cement.

The Carroll Foundry & Machine Works, Bucyrus, O., expect to erect a 130x300-ft. foundry building of steel during the coming summer.

J. N. Oliver, of the Oliver-Finnie Grocer Co., Memphis, Tenn., will erect a cold-storage plant. A large storehouse for the firm is to be built, and work will not be begun on the cold-storage plant until after the completion of the storehouse.

MISCELLANEOUS.

Notes Arranged Alphabetically by States.

Colorado Springs, Colo.—A committee is reported to have been appointed by the Cripple Creek mine owners to consider plans for driving a drainage tunnel; estimated cost of the work is $350,000. J. R. McKinnie is on the committee.

Washington, D. C.—See "Power Plants, Gas and Electricty."

Pensacola, Fla.—Bids will be received for removing from protected harbor 80,000 cu. yd. of rock, weighing about 100 lb. each piece, covering surface of about 350 ft. square, top of rock visible at low tide. Tug and barges furnished. Apply to P. D. Dumont, 16-22 Williams St., Rm. 101, N. Y. City, or P. O. Box "B," Pensacola.

Grant Park, Ill.—Bids will be received until Mar. 28 by F. C. Teverbaugh, Town Clk., Grant Park, for constructing a ditch for Yellowhead and Washington Union Drainage Dist. No. 2, of the towns of Yellowhead and Washington, in the counties of Kankakee and Will. The length of the ditch is about 4½ miles, and the total amount of work is approximately 80,383 cu. yds. Fred. Erichson, Chm. Drainage Comrs.

Chicago, Ill.—Governor Deneen has signed the Dixon Park bond bill. The South Park Bd. will now arrange to submit to the people at the coming election a proposition to issue $2,500,000 bonds to improve and complete the park system.

Lyndon, Ill.—The U. S. Senate has passed the bill authorizing the construction of a dam across Rock River at Lyndon.

Waterman, Ill.—It is stated that bids will be received until Mar. 18 by W. E. Dean, Clk. Union Drainage Dist. No. 1, for constructing open ditches and tile drains, the latter requiring about 16,912 ft. of 6 to 24-in. tile.

**Peru, Ind.*—Harding & Green, of Peru, are reported to have secured the contract on Feb. 24 for digging the Kern-Neff ditch in Bethlehem Township for $15,540.

Webster City, Ia.—Press reports state that bids will be received Mar. 21 by the Co. Aud. for 80,000 yds. excavating for projected ditches near here.

New Orleans, La.—Bids will be received Apr. 29 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Dept., Washington, D. C., for constructiong plant for handling and storing coal at naval station here. Appropriation, $148,000. Plans and specifications will be furnished upon deposit of $5.

New Orleans, La.—Bonds to the amount of $750,000 are reported to have been sold by the Bd. of Port Comrs. on Mar. 1.

Baltimore, Md.—Bids will be received Mar. 15 by the Bd. of Awards (E. Clay Timanus, Pres.) for furnishing and delivering one 16-in. and one 18-in. belt driven lathe; one 22-in., two 24-in. and two 30-in. motor driven lathes and one motor driven vertical drilling machine. Alfred M. Quick, Water Engr.

Whitehall, Mich.—Morton B. Wheeler, of Grand Rapids, is reported interested in the construction of a dam on White River near Whitehall.

Atlantic City, N. J.—Bonds to the amount of $50,000 are reported sold to be used for widening the board walk.

Ft. Mott, N. J.—Bids will be received by Capt. Louis F. Garrard, Jr., Q. M., U. S. A., Mar. 29, for installing screen doors and windows on buildings at Ft. Mott, advertised in The Engineering Record.

West Point, N. Y.—Bids will be received by the Quartermaster on Mar. 30 for furnishing and installing coal conveying apparatus at West Point, as advertised in The Engineering Record.

New York, N. Y.—The Mayor has approved the ordinance passed by the Bd. of Aldermen to issue $750,000 bonds for the improvement and construction of parks, parkways, playgrounds, boulevards and driveways in Manhattan, Richmond, Brooklyn, Queens and Bronx Boroughs.

Eaton, O.—The Comrs. of Preble (Eaton, C. H.) and Darke (Greenville, C. H.) Counties are reported to be considering the construction of the whitewater ditch; probable cost of the work, $17,691.

Columbus, O.—Press reports state that C. E. Perkins, Ch. Engr. State Bd. of Pub. Wks., estimates the cost of rebuilding the aqueduct at Cathage at $15,000.

Cincinnati, O.—The following are the bids for building Lock No. 1, on Levisa Fork of Big Sandy River, opened on Feb. 25, by Lieut.-Col. E. H. Ruffner, Corps of Engrs., U. S. A.; (*a*) Continental Eng. & Contr. Co., Buffalo; (*b*) The Hollerbach & May Contract Co., Evansville, Ind.; (*c*) Mason & Hoge Co., Frankfort, Ky.; (*d*) Louis P. Eigenmann and Chas. Lieb, Rockport, Ind.; (*e*) Baker Contract Co., Pittsburg, Pa.; (*f*) The Dravo Contr. Co., Pittsburg, Pa.; (*g*) J. C. Thomas, Louisa, Ky.; (*h*) Ferro-Concrete Constr. Co., Cincinnati, O.; (*i*) Carpenter & Boxley, Clifton Forge, Va.:

	a.	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*	*h.*	*i.*
3,450 ft. piling ..	$0.40	$0.50	$0.55	$0.50	$0.50	$0.50	$0.40	$0.65	$0.47
98 M.ft. lumber†	61.00	60.00	57.50	75.00	50.00	60.25	60.00	80.00	60.00
850 yd. riprap ..	1.00	1.50	2.00	3.00	2.00	2.05	1.50	2.50	3.00
4,600 " rck. exc.	1.00	1.75	3.00	3.00	2.00	1.85	2.50	3.00	1.65
30,000 " erth exc.	.35	.50	.60	.85	.30	.40	.75	.75	.62
800 " embnkmt	.35	.50	.75	1.00	.50	.36	.50	.50	1.00
100 " puddling	1.00	1.00	2.00	5.00	2.00	1.20	3.00	.50	2.00
7,100 " concrete.	4.70	4.00	5.00	5.50	4.25	5.00	4.50	4.15	4.50
4 pivot stones.	75.00	50.00	50.00	50.00	40.00	42.00	50.00	25.00	50.00
11,500 M.ft. timber‡	100.00	60.00	75.00	75.00	80.00	60.00	100.00	80.00	60.00
260,000 lbs. irn & stl	.0675	.05	.065	.065	.06	.06	.05	.054	.075
Total	.$76,058	$74,720	$95,295	$109,237	$73,980	$82,248	$89,535	$93,482	$89,581

†For coffer dam. ‡In permanent work.

Roosevelt, Ariz.—The following are the bids opened on Feb. 23 at the office of the U. S. Reclamation Service, Phoenix, for the construction of the Roosevelt Dam on Salt River, Ariz., for irrigation purposes (Louis C. Hill, Superv. Engr., Phoenix; (*a*) John M. O'Rourke & Co., Galveston, Tex.; (*b*) Broderick & Ward, St. Louis, Mo.; (*c*) Geddis & Seerie Stone Co., Denver, Colo.; (*d*) Edw. Malley & Co., San Francisco, Cal.; (*e*) Carl Leonardt, Los Angeles, Cal.; (*f*) Mason Hoge Co., Frankfort, Ky.; (*g*) MacArthur Bros. Co., Chicago, Ill.; (*h*) Griffiths & McDermott, Chicago, Ill.; (*i*) Deeks & Deeks, St. Paul, Minn.; (*j*) E. B. & A. L. Stone Co., Oakland, Cal.; (*k*) Mosier-DeGraff Contr. Co., Bufalo, N. Y.; (*l*) Winters, Parsons & Boomer, Spokane, Wash.; (*m*) San Francisco Bridge Co., San Francisco, Cal.; (*n*) Johnson-Sherman Constr. Co., Oklahoma City., Okla. Ter.; (*o*) Bentley-Tuttle & Pelton Co., San Francisco, Cal.; (*p*) Prendergast & Clarkson, Chicago, Ill.; (*q*) Faris-Kesl Constr. Co., Ltd., Boise, Idaho; (r) The American Constr. Co., Denver, Colo.; (*s*) B. M. Zadeck Co., Chicago, Ill.; (*t*) R. H. Hood Co., New York, N. Y.; (*u*) Bentley-Tuttle & Pelton Co., San Francisco, Cal.; (*v*) Burrell Constr. Co., Oakland, Cal.:

		Excavation for foundation.			Masonry.			Concrete.		Over-haul in excess of 300 ft.	
	Time.	Class 1, 50,000 cu. yd.	Class 2, 6,000 cu. yd.	Class 3, 50,000 cu. yd.	Dam, 300,000 cu. yd.	Coping, 400 cu. yd.	Wing walls, 6,000 yds.	Bridges, 2, each.	4 bridge piers, 600 cu.yd.	pr cu.yd.	Total.
a.	2 years.	$1.75	$5.00	$1.50	$3.15	$20.00	$4.75	$7,500	$6.00	$0.15	$1,147,600
b.	17 months.	.96	3.50	2.75	3.10	15.00	15.00	16,500	7.00	.05	1,187,200
c.	33 "	2.00	4.00	1.00	3.35	10.00	4.00	5,500	4.00	.05	1,190,400
d.	26 "	2.50	7.00	3.00	3.25	8.00	3.00	4,000	5.00	.05	1,234,200
e.	23 "	2.30	1.50	1.50	3.45	24.00	3.45	6,500	5.50	.10	1,235,600
f.	3 years.	1.65	2.60	2.60	3.49	6.25	4.13	6,000	5.00	.01½	1,239,380
g.	33 months.	1.75	3.50	2.50	3.70	20.00	7.00	5,000	6.00	.02	1,332,100
h.	30 "	2.25	4.00	2.00	3.80	6.50	3.25	2,575	3.40	.02	1,345,790
i.	2½ years.	4.00	8.00	1.25	3.50	10.00	4.00	6,000	8.00	.03½	1,367,800
j.	40 months.	5.00	10.00	2.00	3.25	30.00	7.50	5,500	8.00	.05	1,397,800
k.	2 yrs. 6 mos.	2.50	3.50	1.50	3.85	25.00	3.85	14,300	12.00	.20	1,399,900
l.	2½ years.	5.40	8.00	1.25	3.50	10.00	4.00	4,000	4.00	.01½	1,431,400
m.	35 months.	2.50	5.00	3.00	4.11	10.00	5.00	5,000	4.00	.03	1,494,400
n.	27 "	.75	6.50	3.40	4.71	10.50	4.40	4,600	7.40	.07	1,601,740
o.	28 "	3.70	7.50	4.15	5.05	8.00	5.50	6,000	5.50	.02½	1,879,500
p.	700 days.	2.85	7.00	2.35	5.25	20.00	8.00	15,000	6.00	.07½	1,896,100
q.	2 years.	3.35	5.25	2.50	5.40	15.00	7.50	14,000	6.00	.10	1,951,600
r.	3 years.†	1.50	3.00	2.50	7.40	12.00	8.75	10,000	7.50	.03	2,444,800
s. (informal bid).......	2 yrs. 6 mos.	7.50	8.30	2.00	7.17	25.00	6.55	8,300	7.00	.20	2,685,900
t. " "	21,000 wkg hrs.	....	....	3.00	3.35	10.00	4.50	7,000	6.00	.04	....
u. " "	23 months.	3.70	7.50	4.15	4.94	8.00	5.50	6,000	5.50	.02½	1,846,500
v.	3 years.	3.00	6.00	2.00	3.90	6.00	3.90	5,000	4.00	.03	1,434,200

†Continuous work.

Items marked thus give the names of parties awarded contracts.

Cincinnati, O.—The following are the bids for building Lock No. 1, on Tug Fork of Big Sandy River, opened Feb. 25, by Lieut.-Col. E. H. Ruffner, Corps of Engrs., U. S. A.; (*a*) Continental Eng. & Contr. Co., Buffalo, N. Y.; (*b*) Carpenter & Boxley, Clifton Forge, Va.; (*c*) Langhorne Contr. Co., Richmond, Va.; (*d*) J. C. Thomas, Louisa, Ky.; (*e*) The Dravo Contr. Co., Pittsburg, Pa.; (*f*) Louis P. Eigenmann and Chas. Lieb, Rockport, Ind.; (*g*) Mason & Hoge Co., Frankfort, Ky.; (*h*) E. C. Nave & Bros., Porthmouth O.; (*i*) The Hollerbach & May Cantr. Co., Evansville, Ind.; (*j*) Baker Contract Co., Pittsburg, Pa.; (*k*) The Ferro-Concrete Constr. Co., Cincinnati, O.:

	a.	*b.*	*c.*	*d.*	*e.*	*f.*	*g.*	*h.*	*i.*	*j.*	*k.*
23,000 lin. ft. piling	$0.40	$0.41	$0.50	$0.25	$0.45	$0.60	$0.39	$0.35	$0.40	$0.30	$0.65
200 M. ft. coffer dam timber	61.00	55.00	60.00	60.00	84.00	75.00	65.00	45.00	60.00	60.00	80.00
1,500 cu. yd. riprap	1.25	3.00	7.00	2.00	1.80	3.00	2.00	2.50	1.50	2.00	2.50
25,000 " earth excavation	.36	.41	.90	.80	.47	1.00	.75	.75	.50	.40	.70
100 " loose rock excavatn	1.00	1.00	1.50	.80	.90	1.00	1.50	1.00	.50	2.00	1.50
100 " solid rock excavatn	1.00	2.00	2.50	.80	2.00	3.00	3.00	1.60	.50	3.00	3.00
5,000 " embankment	.35	1.00	.50	.40	.54	.50	.75	.50	.20	.20	.50
9,700 " concrete	5.00	4.20	5.00	4.00	5.25	5.50	5.00	5.20	4.00	4.70	3.70
4 pieces pivot stones	75.00	40.00	25.00	50.00	42.00	50.00	50.00	60.00	50.00	40.00	25.00
12 M. ft. timber in perm. wrk	100.00	55.00	70.00	100.00	60.00	75.00	75.00	60.00	60.00	80.00	80.00
355,000 lbs. iron and steel	.0575	.06	.07	.05	.051	.0575	.065	.075	.04	.05	.048
320 lin. ft. culvert	4.50	6.50	6.00	4.00	9.60	5.00	5.00	4.75	5.50	5.00	4.00
320 lin. ft. vit. pipe culvert	4.50	8.00	7.00	8.00	8.94	7.00	5.50	5.25	5.50	5.00	5.00
Total, vit. pipe culvert		$105,420	$135,610	$102,140	$117,580	$137,662	$122,195	$121,855	......	......	$110,420
Total, concrete culvert	$106,077	105,900	135,930	103,420	117,369	138,302	122,355	122,015	$92,730	$99,460	110,740

Fernbank, O.—The following are the bids for furnishing about 34,000 bbls. American Portland cement for Dam No. 37, Ohio River, opened at Cincinnati, Feb. 21, by Lieut.-Col. E. H. Ruffner, Corps of Engrs., U. S. A., to be delivered at Fernbank, O.; *a*, Alpha Portland Cement Co., Easton, Pa.; *b*, Castalia Portland Cement Co., Pittsburg, Pa.; *c*, Ironton Portland Cement Co., Ironton, O.; *d*, Virginia Portland Cement Co., New York, N. Y.; *e*, Atlas Portland Cement Co., New York, N. Y.; *f*, Contractors' & Builders' Supply Co., Cincinnati, O.:

	Price, per bbl.	
Brand.	In bbls.	In sacks.
a. ....Alpha	$1.65½	$1,73½
b. ....Tiger	1.80	1.78
c. ....Limestone	1.62	1.64
d. ....Old Dominion	1.63	1.71
e. ....Atlas	1.51	1.46
f. ....Saylors	1.78	2.15

Newport, R. I.—The following are the bids opened on Feb. 23 by Lieut. Col. J. H. Willard, Corps Engrs., U. S. A., for furnishing Portland cement: (*a*) 5,000 bbls. at Boston Neck, R. I.; (*b*) 5,100 bbls. at Ft. Adams, R. I. (price given per bbl.): Commercial Wood & Cement Co., New York, N. Y. (brand, Saylor's), *a* and *b*, $1.68; Berry & Ferguson, Boston, Mass. (brand, Pennsylvania), *a* and *b*, $1.61; Pennsylvania Cement Co., New York, N. Y. (brand, Pennsylvania), *a* and *b*, $1.63; Atlas Portland Cement Co., New York, N. Y. (brand, Atlas), *a* and *b*, $1.49; Alpha Portland Cement Co., Boston, Mass. (brand, Alpha), *a* $1.56, *b* at site $1.60, at wharf, $1.58; Windsor Cement Co., Boston, Mass. (brand, Catskill), *a* $1.43, *b* at site $1.49, at wharf, $1.43.

The lowest bid received same time and place for broken stone, etc., was submitted by J. K. Sullivan, of Newport, as follows: For furnishing 3,800 cu. yd. broken stone and 500 cu. yd. screenings, $1.88 per cu. yd., and 2,300 cu. yd. sand, $1.25, all to be furnished at Boston Neck; and 3,800 cu. yd. broken stone and 300 cu. yd. screenings at $1.85, and 2,000 cu. yd. sand, $1.39, for Ft. Adams, R. I.

The City Council Comn. is reported to have recommended an expenditure of $50,000 for the improvement of Long Wharf.

Waco, Tex.—Bids will be received Mar. 25 by Jas. Knox Taylor, Superv. Archt., Treas. Dept., Washington, D. C., for installing an electric passenger elevator in U. S. Court House and Post Office here.

Winnipeg, Man.—C. J. Brown, City Clk., writes that all bids opened on Feb. 28 for furnishing 5 gondola hopper cars have been rejected, as the style of cars were not satisfactory. New bids will be received.

Bids will be received by the Chmn. Com. on Works on Apr. 4 for a supply of from 20,000 to 30,000 bbls. of cement, as advertised in The Engineering Record.

Portage la Prairie, Man.—It is stated that bids will be received until Mar. 17 by F. A. Whitaker, Secy.-Treas., for 3,000 bbls. of Portland cement.

Panama.—Bids will be received Mar. 24 by the Isthmian Canal Comn., at the office of Maj. H. J. Gallagher, U. S. A. Purchasing Agent, Washington, D. C., for furnishing 12,000 bbl. American Portland cement.

Panama.—Bids will be received Mar. 23 by the Isthmian Canal Comn., at the office of Maj. H. J. Gallagher, U. S. A., Purchasing Agent, Washington, D. C., for furnishing wire screen doors.

Bids will be received until Apr. 13 by the Isthmian Canal Comn. (Maj. H. J. Gallagher, U. S. A., Purchasing Agent), Washington, D. C., for furnishing 10,000 bbls. Portland cement.

PROPOSALS OPEN.

For Proposals see pages 28, 29, 30, 31, 34b and 34c.

WATER WORKS.

Bids Close.		See Eng. Record.
Mar. 13.	Pipe fittings, etc., Winnipeg, Man., Adv. Feb. 25	Feb. 25
Mar. 13.	Stop-cock boxes, Cleveland.O. Adv. Feb. 25.	Feb. 25
Mar. 14.	Pipe, etc., Cincinnati, O.	Feb. 25
Mar. 15.	Tank, Osborne, Kan.	Feb. 25
Mar. 16.	Callicoon Depot, N. Y.	Feb. 25
Mar. 17.	Pipe and cstgs, Cincinnati O. Adv. Feb. 18 to Mar. 4.	Feb. 18
Mar. 18.	Pipe, Washington, D. C. Adv. Mar. 4.	Mar. 4
Mar. 20.	Meeker, Colo. Adv. Feb. 18 to Mar. 11.	Mar. 4
Mar. 20.	Laying pipe, Holden, Mass.	Mar. 4
Mar. 20.	North Bay, Ont.	Feb. 25
Mar. 20.	Boyce, La., Adv. Feb. 25	Feb. 25
Mar. 21.	Valves, Cleveland, O. Adv. Mar. 11.	Mar. 11
Mar. 21.	Hydrants, Cleveland, O. Adv. Mar. 11.	Mar. 11
Mar. 21.	Engine, Toronto, Ont. Adv. Feb. 25 and Mar. 4.	Feb. 25
Mar. 21.	**Well, Ft. Caswell, N. C. Adv. Feb. 4 to 18.**	**Feb. 4**
Mar. 22.	Aberdeen, Miss. Adv. Mar. 11.	Mar. 11
Mar. 23.	Clare, Mich. Adv. Mar. 11.	Mar. 11
Mar. 23.	Boilers, Barnesville, O.	Mar. 4
Mar. 23.	Alpena, Mich. Adv. Mar. 4, 11.	Mar. 4
Mar. 24.	Boiler and Pump House, etc., Ft. Casey, Wash.	Mar. 11
Mar. 25.	Oakes, N. D.	Mar. 4
Mar. 25.	Pipe, valves, etc., Ft. Assinniboine, Mont.	Mar. 4
Mar. 28.	Coal pocket, etc., Atlantic City, N. J. Adv. Feb. 25, Mar. 4.	Feb. 25
Mar. 29.	Ft. Sill, Okla, Ter.	Mar. 4
Mar. 31.	**Meters, Pocatello, Idaho. Adv. Jan. 28 to Feb. 18.**	**Jan. 28**
Mar. —.	**Sylacauga, Ala.**	**Feb. 28**
Mar. —.	**Smith's Grove, Ky**	**Jan. 7**
Apr. 1.	**Irrig., Usk, Wash**	**Dec. 24**
Apr. 3.	Canal work, Cody, Wyo.	Mar. 11
Apr. 6.	Submarine pipe line, Boston, Mass.	Mar. 11
Apr. 10.	**Main supply canal, Belle Fourche, S. D.** Adv. Feb. 18 to Mar. 11.	**Feb. 18**
Apr. 10.	**Pipe & Spcls, Winnipeg, Man.** Adv. Feb. 18 to Mar. 11.	**Feb. 18**
Apr. 12.	Portage Le Prairie, Man.	Mar. 11
Apr. 15.	Alma, Neb.	Mar. 11
Apr. 18.	New Orleans, La. Adv. Feb. 11 to Mar. 11.	Feb. 11
Apr. 25.	Canal, pipe, etc., N.. Orleans, La., Adv. Feg. 18 to Mar. 11.	Feb. 18
May. 1.	**Shirley, Ind.**	**Feb. 11**
May 14.	System, Mansfield, La. Adv. Mar. 4, 11.	Mar. 4
May 15.	Engine, etc., Montreal, Que. Adv. Mar. 11.	Mar. 11
———,	Mains, Oakes, N. Dak.	Mar. 11

SEWERAGE AND SEWAGE DISPOSAL.

Mar. 13.	Wabash, Ind.	Mar. 11
Mar. 14.	Winnipeg, Man. Adv. Mar. 4.	Mar. 4
Mar. 15.	Wheeling, W. Va.	Mar. 11
Mar. 15.	Williamsport, Pa. Adv. Mar. 11.	Mar. 11
Mar. 15.	Alliance, O.	Mar. 11
Mar. 15.	Brooklyn, N. Y.	Mar. 4
Mar. 16.	St. Paul, Minn.	Mar. 11
Mar. 18.	Watertown, Wis.	Mar. 11
Mar. 20.	**North Bay, Ont.**	**Feb. 25**
Mar. 20.	North Yakima, Wash.	Mar. 11
Mar. 20.	Cresco, Ia.	Mar. 11
Mar. 20.	Augusta, Ga.	Mar. 11
Mar. 21.	New York, N. Y.	Mar. 11
Mar. 21.	Des Moines, Ia.	Mar. 4
Mar. 22.	Aberdeen, Miss. Adv. Mar. 11.	Mar. 11
Mar. 22.	Hoboken, N. J.	Mar. 11
Mar. 24.	Granite Falls, Minn.	Mar. 11
Mar. 25.	Oakes, N. D.	Mar. 4
Mar. 29.	Cincinnati, O.	Mar. 11
Mar. 29.	Neodesha, Kan.,Adv. Mar. 11	Mar. 11
Mar. 29.	Portsmouth, O.	Mar. 11
Mar. 29.	Ft. McIntosh, Tex.	Mar. 4
Mar. 31.	Salem, Mass. (2 prop) Adv. Mar. 11.	Mar. 11
Apr. 3.	Ft. Leavenworth, Kan. Adv. Mar. 11.	Mar. 11
Apr. 5.	Logansport, Ind.	Mar. 11
Apr. 5.	St. Joseph, Mo. Adv. Mar. 11.	Mar. 11
Apr. 7.	Ft. Wood, N. Y. H., N. Y. Adv. Mar. 11.	Mar. 11
Apr. 12.	Portage La Prairie, Man.	Mar. 11
Apr. 18.	New Orleans, La. Adv. Feb. 11 to Mar. 11.	Feb. 18
———,	Oakes, N. Dak.	Mar. 11

BRIDGES.

Mar. 15.	Turtle Lake, Wis.	Mar. 11
Mar. 15.	Crawfordsville, Ind.	Feb. 25
Mar. 18.	Des Moines, Ia.	Mar. 4
Mar. 20.	Newton, Kan.	Mar. 11
Mar. 20.	Cleveland, O.	Mar. 4
Mar. 22.	Alexandria, S. Dak.	Mar. 11
Mar. 22.	Greenvile, S. C.	Mar. 11
Mar. 23.	Bloomsburg, Pa.	Mar. 11
Mar. 23.	Wilkesbarre, Pa.	Mar. 11
Mar. 23.	Washington, D. C. Adv. Feb. 25 to Mar. 11.	Feb. 25
Mar. 24.	Cedar Rapids, Ia.	Mar. 11
Mar. 25.	Bentonville, Ark.	Feb. 25
Mar. 28.	Welland, Ont.	Mar. 11
Mar. 30.	Columbus, O.	Mar. 11
Mar. 30.	Procidence, R. I. (2 prop.) Adv. Feb. 18 to Mar. 11.	Feb. 18
Mar. 30.	Manistee, Mich.	Feb. 25
Apr. 4.	Columbus, Ga.	Mar. 4
Apr, 4.	Spokane, Wash.	Mar. 4
Apr. 4.	Alma, Neb.	Feb. 18
Apr. 4.	**Goldendale, Wash**	**Feb. 11**
Apr. 5.	Langdon, N. Dak.	Mar. 11
Apr. 6.	Wabash, Ind.	Feb. 25
Apr. 19.	Moscow, Idaho.	Mar. 11
May 1.	Richland, Ark.	Mar. 11

PAVING AND ROADMAKING.

Mar. 14.	Des Moines, Ia.	Mar. 4
Mar. 14.	Cambridge, O., Adv. Feb. 25	Feb. 25
Mar. 15.	Terre Haute, Ind.	Mar. 11
Mar. 15.	South Bend, Ind.	Mar. 4
Mar. 15.	Rensselaer, Ind.	Feb. 25
Mar. 15.	Elizabeth, N. J.	Feb. 25
Mar. 16.	Camden, N. J.	Mar. 11
Mar. 16.	Brantford, Ont.	Mar. 11
Mar. 16.	**Bloomfield, Ind.**	**Feb. 18**
Mar. 17.	North Greece, N. Y.	Mar. 11
Mar. 18.	Seattle, Wash.	Mar. 11
Mar. 18.	Cincinnati, O.	Feb. 25
Mar. 20.	South Orange, N. J. Adv. Mar. 11.	Mar. 11
Mar. 20.	Brookville, Ind.	Mar. 11
Mar. 20.	Augusta, Ga.	Mar. 11
Mar. 20.	Clairton, Pa.	Mar. 4
Mar. 20.	Helena, Mont.	Mar. 4
Mar. 20.	Jacksonville, Fla.	Mar. 4
Mar. 20.	Cincinnati, O.	Mar. 4
Mar. 21.	New York, N. Y.	Mar. 11
Mar. 21.	St. Louis, Mo.	Mar. 11
Mar. 21.	Bessemer, Ala.	Mar. 4
Mar. 22.	Independence, Mo.	Mar. 11
Mar. 23.	Ft. Wayne, Ind.	Mar. 11
Mar. 23.	Ft. Leavenworth, Kan.	Mar. 11
Mar. 23.	Jerry City, O.	Mar. 4
Mar. 24.	Cincinnati, O.	Mar. 4
Mar. 25.	Lancaster, Pa.	Mar. 4
Mar. 25.	Cincinnati, O.	Mar. 4
Mar. 27.	Cincinnati, O.	Mar. 11
Mar. 27.	Tacoma, Wash.	Mar. 11
Mar. 29.	Lima, O.	Mar. 11
Mar. 29.	Cincinnati, O.	Mar. 11
Mar. 31.	Detroit, Mich.	Mar. 11
Mar. —.	Tacoma, Wash.	Mar. 4
Apr. 1.	Norwood, O.	Mar. 11
Apr. 3.	Montgomery, Ala.	Mar. 11
Apr. 5.	Peru, Ind.	Mar. 4
Apr. 18.	La Crosse, Wis.	Feb. 25
May 1.	Parkridge, Ill.	Mar. 11

POWER, GAS AND ELECTRICITY.

Mar. 14.	Washington, D. C.	Feb. 18
Mar. 15.	Calgary, Alberta, N. W. Ter.	Mar. 11
Mar. 15.	New York, N. Y.	Mar. 4
Mar. 17.	Jefferson Barracks, Mo.	Feb. 25
Mar. 20.	Galesbury, Ill.	Mar. 11
Mar. 20.	Holyoke, Mass.	Mar. 11
Mar. 20.	**Washington, D. C. Adv. Feb. 11.**	**Feb. 11**
Mar. 21.	Washington, D. C.	Mar. 11
Mar. 21.	Norwalk, Ohio. Adv. Feb. 25 and Mar. 4.	Feb. 18
Mar. 22.	Aberdeen, Miss. Adv. Mar. 11.	Mar. 11
Mar. 23.	Alpena, Mich. Adv. Mar. 4, 11.	Mar. 4
Mar. 23.	Dayton, O.	Mar. 4
Mar. 24.	Chicago, Ill., Adv. Mar. 11	Mar. 11
Mar. 25.	Portsmouth, N. H.	Feb. 25
Mar. 27.	Laconia, N. H.	Mar. 11
Mar. 27.	Santa Monica, Cal.	Mar. 4
Mar. 28.	Dover, N. J.	Mar. 4
Mar. 30.	Chickamauga Park, Ga. Adv. Mar. 11.	Mar. 11
Mar. —.	Sylacauga, Ala.	Feb. 25
Apr. 1.	Portsmouth, N. H.	Mar. 11
Apr. 1.	Wernersville, Pa.	Mar. 11
Apr. 3.	Lakeport, Cal.	Mar. 4
Apr. 3.	**Cape Charles, Va.** Adv. Feb. 25.	**Feb. 25**
Apr. 11.	Shreveport, La.	Feb. 18
Apr. 12.	Lockport, Ill. Adv. Feb. 18.	Feb. 18
Apr. 15.	Alma, Neb.	Mar. 11
Apr. —.	**Ft. Valley, Ga.**	**Jan. 21**
May 1.	**Shirley, Ind.**	**Feb. 11**
———.	**Branchville, S. C.**	**Feb. 18**
———.	**Laconia, N. H. Adv. Jan. 28.**	**Jan. 28**

BUILDINGS.

Mar. 12.	School plans,Binghamton,N.Y.	Mar. 4
Mar. 13.	School, New Bedford, Mass.	Mar. 11
Mar. 13.	Schools, New York, N. Y.	Mar. 4
Mar. 13.	Schools, Kearny, N. J.	Mar. 4
Mar. 13.	City Hall, Oskaloosa, Ia.	Feb. 25
Mar. 13.	School, Cleveland, O.	Feb. 18
Mar.13.	**P. O. Bldg., Hammond, Ind.** Adv. Jan. 28, Feb. 4.	**Jan. 28**
Mar. 14.	Schools, Port Chester, N. Y.	Mar. 11
Mar. 14.	School, Indianapolis, Ind.	Mar. 4
Mar. 14.	Remod. Jail, Grand Forks, N. D.	Feb. 18
Mar. 14.	**School, Kearny, N. J.**	**Feb. 11**
Mar.14.	**P. O. Bldg., Moberly, Mo.** Adv. Jan. 28, Feb. 4.	**Jan. 28**
Mar. 15.	Hotel, Clarksville, Ark.	Mar. 11
Mar. 15.	School, Galt, Ont.	Mar. 11
Mar. 15.	School, Spencer, N. Y.	Mar. 11
Mar. 15.	Hotel, Watonga, Okla. Ter.	Mar. 11
Mar. 15.	Engine house, Omaha, Neb.	Mar. 4
Mar. 15.	Bus. Bldg., Cedar Rapids, Ia.	Mar. 4
Mar. 15.	Storehouse, Ft. Monroe, Va.	Mar. 4
Mar. 15.	School, Starbuck, Minn.	Feb. 25
Mar. 15.	School, Chippewa Falls, Wis.	Feb. 25
Mar. 15.	Y. M. C. A. Bldg., Seattle Wash.	Feb. 25
Mar. 15.	Plumb. Pub. Bldg., Nat. Soldiers' Home, Va.	Feb. 25
Mar. 15.	Church, Clyde, Kan.	Feb. 18
Mar. 15.	**Md. Insti. plans, Baltimore, Md.**	**Feb. 11**
Mar. 15.	**Univ. plans, Washington, D. C.**	**Feb. 11**
Mar. 15.	Jail, Camden, N. J.	Feb. 4
Mar. 16.	Schools, Page, N. Dak.	Mar. 11
Mar. 16.	Bank, Sioux City, Ia.	Mar. 4
Mar. 17.	School, Salem, N. Y.	Mar. 11
Mar. 17.	Wagon shed. Ft. Caswell, N.C. Adv. Feb. 18 to Mar. 11.	Feb. 18
Mar. 18.	Htg., etc., Pub. Bldg., Ft. Logan H. Roots, Ark.	Mar. 11
Mar. 20.	School, Little Rock, Ark.	Mar. 11
Mar. 20.	Church, Joplin, Mo.	Mar. 11
Mar. 20.	School, Wauwatosa, Wis.	Mar. 11
Mar. 20.	Bus. Bldg., Chicago, Ill.	Mar. 11
Mar. 20.	Union Depot, Meridian, Miss.	
Mar. 20.	Y. M. C. A. Brandon, Man. Adv. Mar. 4, 11.	
Mar. 20.	Post Bldg., Chickamauga Park, Ga., Adv. Mar. 4, 11	
Mar. 20.	School, Lascruces, N. Mex.	
Mar. 20.	**P. O. Bldg., Elizabeth City, N. C., Adv. Feb. 4, 11**	
Mar. 21.	School, Pittsburg, Pa.	
Mar. 21.	Plumbing Pub. Bldg., Albany, N. Y.	
Mar. 21.	Church, Clarkville, Ia.	
Mar. 21.	Hospital, New York, N. Y.	
Mar. 21.	**Armory, Rochester, N. Y.** Adv. Feb. 18, 25.	
Mar. 21.	**P. O. Bldg., Laredo, Tex. Adv. Feb. 4.**	
Mar. 22.	Pub. Bldg., Baltimore, Md.	
Mar. 22.	Pub. Bldg., Detroit, Mich.	
Mar. 23.	School, Selma, O.	
Mar. 23.	School, Baton Rouge, La.	
Mar. 23.	**P. O. Bldg., Sherman, Tex. Adv. Feb. 4, 11.**	
Mar. 24.	School, Marathon, Wis.	
Mar. 25.	Bus. Bldg., New Martinsville, W. Va.	
Mar. 25.	School, Norway, Ia.	
Mar. 25.	Church, Lincoln, Kan.	
Mar. 27.	School, Newark, O.	
Mar. 27.	School, Cleveland, O.	
Mar. 27.	Library, Attleborough, Mass.	
Mar. 27.	City Hall, Alpena, Mich.	
Mar. 27.	**P. O. Bldg., Lebanon, Pa.** Adv. Feb. 11, 18.	
Mar. 28.	School, Indianapolis, Ind.	
Mar. 28.	Library, Cincinnati, O.	
Mar. 28.	**P. O. Bldg, Superior, Wis.**	
Mar. 30.	Post Bldg., Ft. Riley, Kan. Adv. Mar. 11.	
Mar. 30.	Htg., P. P., Waterloo, Ia.	
Mar. 31.	School, Peterboro, Ont.	
Mar. 31.	School, Cleveland Heights, O.	
Mar. —.	Theatre, Philadelphia, Pa.	
Mar.—.	**School, Klamath Falls, Ore.**	
Apr. 1.	Court House, Corsicana, Tex.	
Apr. 1.	Schools, Curtice, O.	
Apr. 1.	Court House, Baraboo, Wis.	
Apr. 1.	Y. M. C. A. plans, Binghamton, N. Y.	
Apr. 3.	School, Cleveland, O.	
Apr. 3.	Bus. Bldg., Cincinnati, O.	
Apr. 3.	School, Ithaca, N. Y. Adv. Mar. 4, 11.	
Apr. 3.	School, Muncie, Ind.	
Apr. 3.	Court House, Kentland, Ind.	
Apr. 3.	P. O. Bldg., Macon, Ga.	
Apr. 3.	Court House, Newton, Ind.	
Apr. 5.	Post Bldgs., Ft. McKinley, Me.	
Apr. 5.	**Court House plans, New Orleans, La.**	
Apr. 6.	Post Office,Marblehead, Mass. Adv. Mar. 4, 11.	
Apr. 17.	School, Richmond, Va.	
Apr. 15.	Court House, Grundy, Va.	
Apr. —.	School, New Haven, Conn.	
Jun. 15.	Court House plans, New Orleans, La.	

MISCELLANEOUS.

Mar. 13.	Ferry structures, St. George, S. I., N. Y.	
Mar. 14.	Garb. Disp., Boston, Mass.	
Mar. 14.	Broken stone, etc., New Brighton, S. I., N. Y.	
Mar. 14.	St. sprinkling, New Brighton, S. I., N. Y.	
Mar. 14.	**Mach. tools, Washington, D. C.**	
Mar. 14.	**Cement, Wheeling, W. Va.** Adv. Feb. 18 to Mar. 11.	
Mar. 15.	Lathes, Baltimore, Md.	
Mar. 15.	Ditch, Clarion, Ia.	
Mar. 15.	Mail conveyors, Chicago, Ill.	
Mar. 15.	El. Ry. wrk, Bennington, Vt.	
Mar.15.	El. Ry. franchise, Modesta, Cal.	
Mar. 15.	**Street Signs, Columbus, O.** Adv. Feb. 25, Mar. 4.	
Mar. 15.	**Cable, Washington, D. C.**	
Mar. 15.	El. Ry. work, Pittsfield, Mass.	
Mar. 15.	Cement, Peterborough, Ont.	
Mar. 15.	**Dam, etc., Los Angeles, Cal. Adv. Jan. 21 to Feb. 18.**	
Mar. 17.	Cement, Portage La Prairie, Man.	
Mar. 17.	**Dredge, etc., St. Louis, Mo.** Adv. Jan. 21 to Mar. 11.	
Mar. 18.	Tile drain, Waterman, Ill.	
Mar. 18.	**Cement, etc., Wilmington,N.C.** Adv. Feb. 18 to Mar. 11.	
Mar. 20.	Garb. Disp., Perth Amboy, N. J.	
Mar. 20.	**Ditch., Macon, Mo.**	
Mar. 20.	Levee, England, Ark.	
Mar. 21.	Ditches, Webster City, Ia.	
Mar. 21.	El.Ry. franchise, Los Angeles, Cal.	
Mar. 22.	Drainage work, Ft. Dodge, Ia.	
Mar. 23.	Screen doors, Panama	
Mar. 24.	Cement, Panama	
Mar. 24.	El. Ry. franchise, Benicia,Cal.	
Mar. 25.	Elevator, Waco, Tex.	
Mar. 25.	Grading, etc., New Orleans, La.	
Mar. 25.	Wharf, New Orleans, La.	
Mar. 27.	Riprap embankment, Ft. Strong, Mass.	
Mar. 28.	Drainage, Grant Park, Ill.	
Mar. 29.	Screens, Ft. Mott, N. J. Adv. Mar. 11.	
Mar. 30.	Coal conveying apparatus, West Point, N. Y. Adv. Mar. 11.	
Mar. 30.	Rock excav., Boston, Mass. Adv. Mar. 4, 11.	
Mar. 31.	**El. Ry., Shanghai, China**	
Apr. 4.	Cement, Winnipeg, Man. Adv. Mar. 11.	
Apr. 4.	Ditch, Fairmont, Minn.	
Apr. 10.	**Channel work, Bermuda**	
Apr. 13.	Cement, Panama	
Apr. 15.	R. R. work, Norfolk, Va.	
Apr. 15.	Electric crane, Bremerton, Wash.	
Apr. 25.	Dredging, New Orleans, La.	
Apr. 29.	Coal handling plant, New Orleans, La.	
May 10.	**Ditch, Stevens Point, Wis.**	
———,	Removg.stone, Pensacola, Fla.	
———.	R. R. ties, Atlanta, Ga. Adv. Mar. 4.	

Items marked thus give the names of parties awarded contracts.